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RECORDS OF THE ZOOLOGICAL SURVEY OF INDIA

Neuroptera fauna of North-East India

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INTRODUCTION

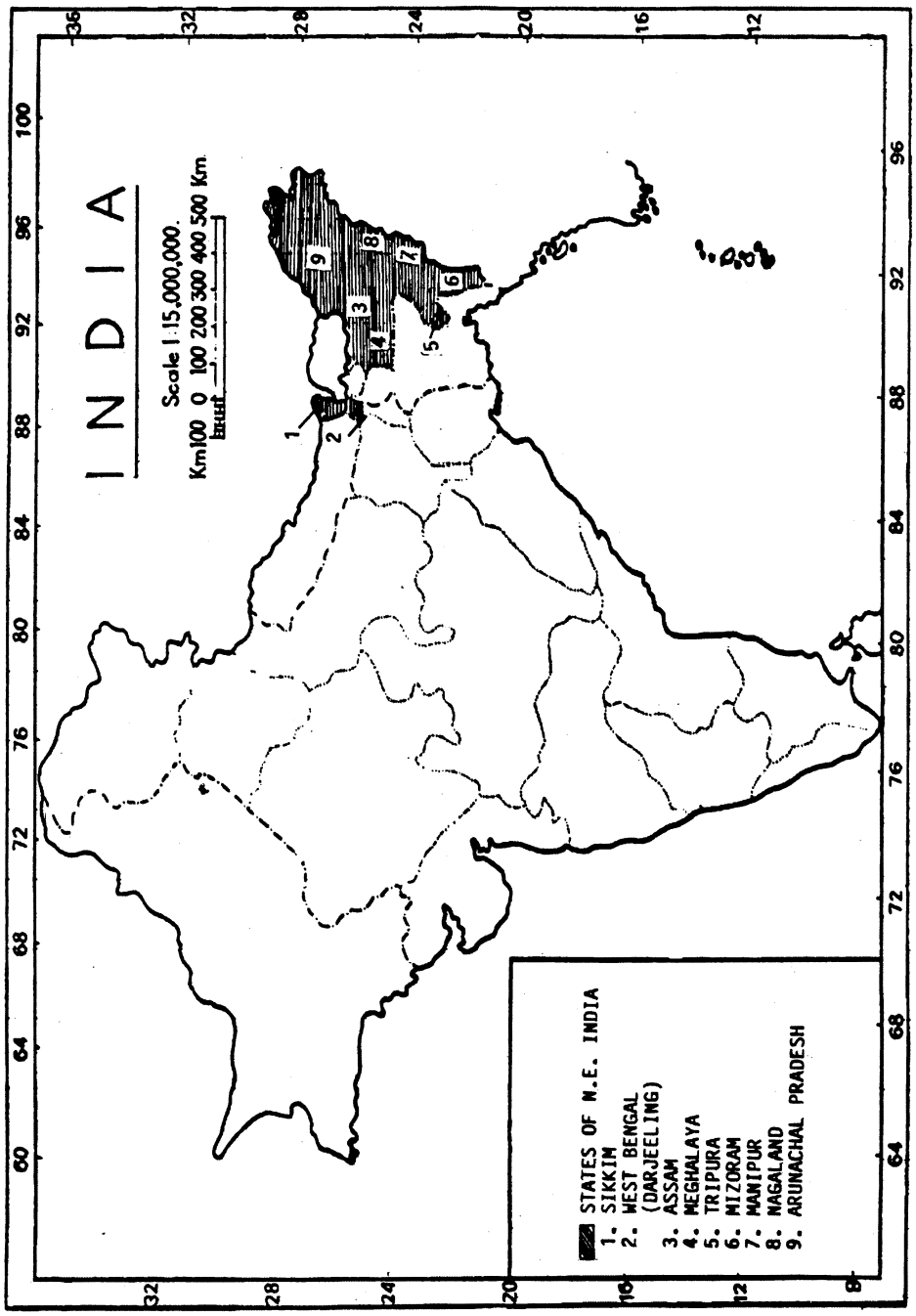
The neuropterans are valuable allies of man. The order includes quite a large number of species which are predacious on different insect pests in their larval and adult stages. These active predators destroy the agri-horticultural pests like aphids, coccids, thrips, moths and mites and thus, are beneficial to mankind. Due to their carnivorous habits, some Neuroptera offer a better scope to the people for deploying them in biological control measure. Possibly for these reasons, these insects have attracted the attention of entomologists in recent times and their studies mostly relate to taxonomy. Even in this aspect, contribution from India is negligible. Keeping in view, the present study has been envisaged on North-East India comprising of nine states, namely, Arunachal Pradesh, Assam, Meghalaya, Manipur, Nagaland, Mizoram, Tripura, West Bengal (Darjeeling) and Sikkim (Map 1-2).

The taxonomy of the majority of the families of Neuroptera is confused and difficult to study due to large number of inadequately described taxa. These descriptions lack the information required for determination of the species. Thus, in many cases it is not possible to identify the species from the original description.

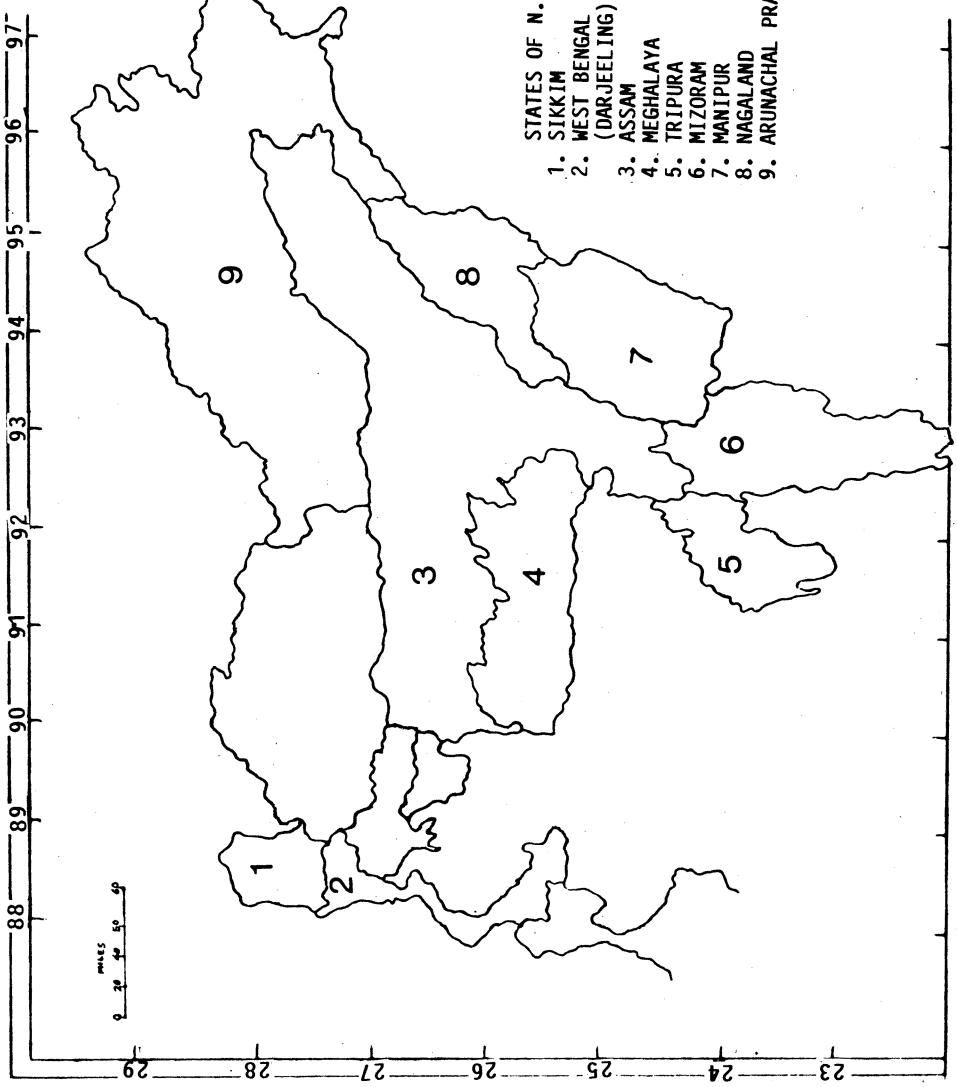
The aim of the present study is to provide diagnostic characters of all the taxa dealt with, keys at all levels and also to clear up the nomenclature indicating the synonyms of valid genera and species. From the examined material, detailed description of new species, and new locality records have been incorporated. Over and above, the text has been suitably illustrated, new combination of the species has been included and where the material is not available for study the original description of the author of the species has been included for ready reference with suitable remarks. It is also accompanied by a table showing the distribution of the species in North-East India. Only in a few cases, where both the literature and material is not available for study, references and distributions have been provided. Maps showing the areas of North-East India, and also a bar chart (Pl. G) showing the seasonal distribution of species based on collection data have been included. Bibliography has been provided at the end. Thus an effort has been made to prepare a consolidated account of Neuroptera from North-East India. Altogether 128 species in 69 genera and 11 families are reported in the paper.

HISTORICAL RESUME

Linnaeus for the first time provided an account of Neuroptera. This was followed by a large number of workers who made valuable contributions in the Neuropterology of the world including India. Some of the references may be referred to here : Linnaeus (1758, 1767), Fabricius (1775-1793), Burmeister (1839), Lefebvre (1842), Westwood (1848-1867), Walker (1853-1858), Hagen (1858, 1866), Brauer (1864-1868), MacLachlan (1868-1891), Frauenfeld (1868), Gerstaecker (1884, 1893), Albarda (1891), Banks (1899-1950), Enderlein (1906, 1910), Navas (1905-1935), Weele (1907-1910), Needham (1909), Okamoto (1910, 1911), Esben-Petersen (1912-1931), Krüger (1912-1914), Nakahara (1915-1971), Tillyard (1916 & 1926), Dover (1921), Fraser (1922, 1951), Withycombe (1925), Alexandrov-Martynov (1926), Chatterjee (1934), Handschin (1935), Kimmins



MAP 1 : Map of India showing jurisdiction of North-East India.



MAP 2 : Map of North-East India showing different states.

(1935-1955), Killington (1936-1937), Carpenter (1940), Castellarnau (1946), Tjeder (1954-1977), Markl (1954), Principi (1956), Zimmerman (1957), Kuwayama (1959, 1962), Adams (1959-1970), Acker (1960), Zeleny (1962), Aspock & Aspock (1965-1968), Holzel (1967-1972), Ghosh (1968-date), Stange (1970), Meinander (1972, 1990), Aspock, H., Aspock, U. & Holzel (1980), New (1980-1991), Aspock, U. (1983), Brooks (1983), Penny & Monserrat (1983), Yang (1988), Brooks & Barnard (1990), Manserrat (1981-1993), Oswald (1993), Makarkin (1994), Elliot (1996), Penny & Lee (1996).

Of the above named workers, Westwood (1848), Walker (1853), MacLachlan (1869-70, 1891), Navas (1905, 1910, 1912, 1914-15, 1923, 1930), Needham (1909), Banks (1911, 1913-14, 1933, 1939), Withycombe (1925), Kimmins (1942-43), Nakahara (1960), Meinander (1972), Brooks (1983), Ghosh (1984, 1988, 1990-91) may be referred to who published some papers on Neuroptera from North-East India. However, Monserrat (1990) and Brooks & Barnard (1990) in their revisionary works also referred to several species from the concerned area.

ABBREVIATIONS USED

A = anal veins; ant. soc. = antennal socket; bc = basal cardo; BL = banksian line; bs = basal subcostal cross vein; C_1 and C_2 = first and second cubital cell; cl = claw; c = costa; clp = clypeus; coll. = collector; Cu = cubitus; Cu_1 = cubitus anterior; Cu_2 = cubitus posterior; Cup = basal fork of cubitus; cx = coxa; dc = distal cardo; dcc = distal cubital cell; e = eye; ep = epicranium; ex.(s) = example(s); fe = femur; fig.(s) = figure(s); fl = flagellum; fr = frons; ga = galea; gl = gonapophysis lateralis; gn = gonarcus; gp = gonapophysis posterioris; Hsc = hypostigmatic cell; im = intramedian cell; ig = inner gradate; la = lacinia; lb = labrum; lbp = labial palpus; Loc = locality; M = media; m_1 = first median cell; m_2 = second median cell; M_1 = anterior media; M_2 = posterior media; md = mandible; msc = mesoscutum; mtscl = metascutellum; mxp = maxillary palpus; ped = pedicel; plm = palpomere; pm = paramere; pn = pronotum; ps = prescutum; Psc = pseudocubitus; Psm = pseudomedia; Pt = pterostigma; R = radius; R_1 = radius 1; r-m = radio-medial crossvein; Rs = radial sector; s= scape; Sc = subcosta; sp = spur; st = stipes; tar = tarsus; tr = trochanter; v= vertex.

TOPOGRAPHY, CLIMATE AND VEGETATION

Topography

North-East India comprises of West Bengal (Darjeeling), Sikkim, Assam, Manipur, Meghalaya, Mizoram, Nagaland, Tripura and Arunachal Pradesh. This region lies in between 89°458' and 97°238' E longitudes and 22° and 29°28' N latitudes.

Though this part is mainly a mountaineous terrain but it has three distinct physical features :

(i) *The Brahmaputra valley* : It is an old alluvial plain stretching over an approximate area of 750 x 80 km. It is bounded by Arunachal Pradesh and Bhutan on the north, Meghalaya hills in the south and Patkoi and Naga hills in the east. The river Brahmaputra rises from the Himalayas in the north and its total length from the source to the sea is 2900 km.

(ii) *The Surma or Barak valley* : It is a plain through which flows the river Surma.

(iii) *Mountains and hill ranges* : The orogenic movement is fundamentally responsible for the upheaval of Himalayas including the north-eastern mountain ranges of India. Such ranges include high hills in Darjeeling (West Bengal), Sikkim, Meghalaya, Manipur, Nagaland, Mizoram and Arunachal Pradesh. Of these, the Darjeeling and Sikkim Himalayas include a deep and wide basin of the river Teesta coupled with its massive tributaries. Besides, Singlalia range between Darjeeling and Nepal and Dongkya range on the east of Sikkim are also notable. The Darjeeling range of the Himalayas extends particularly from the Senchal Peak (2,615 m) and the Terai at a minimum elevation of about 180 m. Besides, the Himalayas in the North, the Meghalaya hills (Khasi, Garo and Jaintia) in the south, Patkoi, Naga hills and Manipur plateau in the east and the Lushai hills extending from south of Manipur to Burma are also worth-mentioning.

Climate

North-East India is wellknown for its highly humid tropical climate. On the whole the climate is cool. The annual rainfall varies between 250 cm. to 310 cm. and the highest rain fall area is Mawsynrum - Cherrapunji of Meghalaya.

Vegetation

Due to varied climatic conditions, a wide variety of vegetation are found in North-East India and they may be classified as follows :

(a) *Tropical vegetation* : This type includes various types of evergreen and semi-evergreen forests, grasslands and swamps and found upto an altitude of 900 m. Evergreen forests are thick and found in Assam valley, foot hills of Eastern Himalayas and in the lower part of Naga hills and Manipur. Grasslands with grasses of great heights are found in riparian flats flooded by the water of river Brahmaputra.

(b) *Temperate vegetation* : This type of vegetation is found in Shillong plateau, Naga, Mizo, Mikir hills and in Arunachal Himalaya. This is found between altitudes of about 1300 m. to 2500 m. Vegetations of Khasi and Jaintia hills of Meghalaya are important for insect species richness.

(c) *Alpine vegetation* : This type is limited to an altitude of 4500 m. to 5500 m. and the vegetation becomes gradually rare. Trees are absent and the vegetation mainly consists of herbs and shrubs of stunted growth.

MATERIAL AND METHOD

(a) *Collection* : Neuroptera may be collected by sweeping with a proper net from herbages, by arial netting when the insects are on wings or by beating the shrubs or branches of trees with a stick over a white sheet of paper or umbrella. Light traps are also used to collect the insects at night. An artificial light like Petromax gas light serves the purpose for the collection of insects at night.

(b) *Preservation* : Large and hard-bodied specimens are preserved in dry condition after being killed in vapours of cyanide or benzene while the small and soft-bodied ones are preserved in 80% alcohol. The dry insects are then properly stretched and pinned but the specimens preserved in alcohol may be studied as such.

Study of genitalia : The terminal abdominal segments of males and females are removed and boiled in 5-10% KOH for a few minutes. These were then washed in water and dehydrated through upgrades of alcohol. Microscopical examination is done in glyceral. In case of permanent preparation, the parts are again washed in Ethanol and finally sealed with D.P.X. otherwise these are preserved in microvials containing 90% alcohol.

Drawings : Drawings of genitalia and other structures are made with the help of camera lucida and measurements are taken in mm.

(c) *Measurements* :

Body length : Distance from middle of epicranium to abdominal tip.
Antenna : Length from base to flagellum tip.
Wing : Length from base to apex.

EXTERNAL MORPHOLOGY AND TERMINOLOGY OF NEUROPTERA

Some of the morphological features, relevant to the present study are given below. Different authors used different terminologies in respect of wings, male and female genitalia. In the present study, the excellent works by Comstock (1918), Tillyard (1926) and Markl (1954) on wings and that of Tjeder (1970) on male and female genitalia have been consulted.

Neuropterans are small, medium sized or sometimes large soft bodied insect. The body of neuroptera is divisible into head, thorax and abdomen.

Head
(Plate 1)

Head (Fig. 1) : hypognathus with biting mouth parts which sometimes produced in the form of a rostrum in the family Nemopteridae.

Vertex : arched dorsally.

Frons (Fig. 1, fr.) : separated laterally from the genae by frontal sutures and anteriorly from the clypeus by the clypeofrontal suture.

Clypeus (Fig. 1, clp.) : divided into a large postclypeus and a smaller anteclypeus.

Labrum (Fig. 2) : lying in front of the clypeus and narrower than it.

Mouth parts : formed of a pair of well-developed and chitinised mandibles (Fig. 3), a pair of

maxillae (Fig. 7), each consisting of cardo (bc & dc), stipes (st.), galea (ga), lacinia (la) and five segmented palpus (max.), and a labium (Fig. 8) consisting of submentum, mentum (m), prementum (pm), ligula (reduced or absent) and a pair of 3 segmented palpi (lbp).

Compound eyes : large, prominent, widely separated and placed laterally on either side of the epicranium (Fig. 1, ep). Ocelli when present, 3.

Antennae (Figs. 4, 5) : elongate or short, filiform (e.g. Chrysopidae) moniliform (e.g. Hemerobiidae), pectinate (e.g. males of Dilaridae) and clavate or capitate (e.g. Ascalaphidae and Myrmeleontidae); antennae divisible into three regions, viz., scape or first segment (Fig. 1, s), pedicel (fig. 1 & 4, ped) or second segment and flagellum (fig 1, 4-5, fl) composed of other segments.

Thorax

Thorax (Pl. 3, Fig. 1) : consisting of three well-defined segments, e.g. prothorax, mesothorax and metathorax; prothorax short or elongate; meso- and metathorax distinct but sometimes not sharply demarcated.

Wings : Two pairs, usually subequal or membranous (hindwing elongate and filiform in Nemopteridae, reduced in *Conwentzia* of Coniopterygidae or in some of the genera of Hemerobiidae); these at rest held vertically over dorsum; generally hyaline, sometimes variably clouded or covered by powdery secretion (Coniopterygidae), with or without spots; veins and cross veins generally with micro or macrotrichia; margin with fringes, with (Hemerobiidae, Sisyridae) or without trichosor (Chrysopidae, Myrmeleontidae, Ascalaphidae); cross veins numerous (Osmylidae, Myrmeleontidae, Ascalaphidae) or a few (Coniopterygidae, Sisyridae); branches of longitudinal veins generally with (Suborder Planipennia) or without (Suborder Megaloptera) furcations at margin; wing-coupling apparatus with distinct jugal lobe in forewing and frenulum in the form of haired extension in hindwing (Sisyridae) or slightly to markedly reduced (Coniopterygidae, Osmylidae); venation (PL. 2, figs. 1-2) : costa (c) : costal area broad or narrow; numerous costal veins (absent in Coniopterygidae), these simple (Chrysopidae, Mantispidae, Ascalaphidae) and forked (Osmylidae, Hemerobiidae, some Myrmeleontidae); forewing sometimes with a recurrent humeral veinlet (some genera of Hemerobiidae); pterostigma pronounced or illdefined; subcosta (SC) : a strong vein meeting c near apex (Dilaridae, Sisyridae, Hemerobiidae, Chrysopidae) ending in costal margin before pterostigma (Inocellidae) or joining radius 1 near apex of wing and continuing as one vein (Corydalidae, Osmylidae, Ascalaphidae, Myrmeleontidae); radius (R) : long, parallel and close to SC; united with Sc at apex (*vide supra*) or running separtely (Sisyridae, Hemerobiidae, Dilaridae, Chrysopidae); radial sector (RS) : usually pectinately branched, these sometimes forming anterior banksian line (Myrmeleontidae); media (M) at most twice branched with branches sometimes forked; such forks seldom unite to form intra-median cell (im) and then these forks beyond im fuse with branches of Rs forming pseudomedia or Psm (Chrysopidae); Cubitus (Cu) : sometimes basal forking near base forming cup (Myrmeleontidae); Cu again forked and forming Cu_1 and Cu_2 (Myrmeleontidae); branches of Cu_1 sometimes forming posterior banksian line in Cubital field (Myrmeleontidae); Cu_2 sometimes shortened (Myrmeleontidae), well developed (Corydalidae, Osmylidae, Dilaridae, Sisyridae, Ascalaphidae

etc.); pseudocubitus (Psc) consisting of number of branches of Rs, branches of M and Cu_1 (Chrysopidae); anal (A) : 1A, 2A and 3A usually present; gradates : one or more series of cross veins running obliquely across wing usually on its distal half and more or less parallel with outer margin (Hemerobiidae, Chrysopidae, Osmylidae etc.). Legs (PL. 1, Fig. 6) : well developed, slender or stout; forelegs being raptorial in family Mantispidae; each leg consisting of coxa, trochanter, femur, tibia and tarsus; forecoxae widely separated but coxae of the subsequent legs closely approximated and more closely associated with the main body of the thorax; tibiae generally with spurs; tarsi 5-segmented and sometimes provided with claws.

Abdomen

Abdomen (PL. 3, fig. 2, male; PL, 3, fig. 4, female) : 10-segmented, long and narrow; 1st segment short and membranous, but segments 2-8 well developed, 9th and 10th segments modified in various ways; 8 pairs of abdominal spiracles on segments 1-8.

Male genitalia : 8th segment discleritous and usually separated from 9th which either syncleritus or discleritus; frequently, 9th tergite middorsally divided into a part of plates; 9th sternite in majority of Neuroptera appearing as a simple plate or half ring, or an elongated one, covered from above by lower part of membrane that forms hind body wall of abdominal end; phallic structures usually situated between anus and 9th sternite; gonarcus (gn, PL. 3, fig. 3) : predominant structure of phallic complex, present in all families; situated dorso-basally as a generally arch-shaped structure with its arches directed downwards or inwards; may be divided dorsally into a pair of plates; when undivided, its median part frequently ending in a backwardly directed tooth-like process, mediuncus; each arch of gonarcus may have a lateral process, antoprocessus; in many genera, additional vertically movable structure, arcessus, attached to gonarcus below its central part present; below the gonarcus or fused with it a pair of parameters (pa., Pl. 3, fig. 3) usually present; a peculiar organ, hypandrium internum present in most families and situated at base of ductus ejaculatorius just at the place where two gonoducts unite; anal segment present as three processes, e.g., anoprocessus (uppermost), catoprocessus (lowermost) and cercus (middle) in Corydalidae, united into a single large plate, ectoproct in most Neuroptera, and cercus reduced to a callus-cerci bearing trichobothria.

Female genitalia (Fig. 14) : 8th segment frequently appearing as a dorsal half ring; the tergite with often downwardly prolonged sides, which sometimes fused. Sternite generally missing; below 8th tergite instead of the sternite, a subgenital plate often divided longitudinally into a pair of plates present; 9th tergite appearing as half ring or longitudinally divided; very often lateral parts of tergite reaching under surface of abdomen; two pairs of gonapophysis, e.g., gonapophysis lateralis (gl., Pl. 3, fig. 4) and gonapophysis posterioris (gp., PL. 3, fig. 4) from 9th segment forming long ovipositors in some families; more commonly gonapophysis laterales present as pair of short or elongated plates, proceeding from lower hind margin of 9th segment or in some Nemopteridae, ventrally behind secondary 8th sternite and below 9th tergite; lower parts of 9th segment and usually also gonapophysis laterales enclosing the genital chamber containing the openings of the common oviducts and bursa copulatrix; the spermatheca usually strongly sclerotised and pigmented, being very different in shape in different families; anal segment shaped much as in male; generally, however, each ectoproct appearing as a plate without processes and with or without a callus-cerci, and with trichobothria.

CLASSIFICATION

The order Neuroptera was erected by Linnaeus (1758). Later it was found that Linnaeus's Neuroptera represented a heterogenous group being formed of a large number of heterometabolic and holometabilic insects. These insects were later separated into orders of their own namely, Odonata, Plecoptra, Ephemeroptera, Psocoptera, Mecoptera, Trichoptera, besides true Neuroptera.

The name Neuroptera is presently used in two different senses. Imms (1925) and Tillyard (1926) designate the order Neuroptera which comprises of the suborders Megaloptera (including Raphidioptera) and Planipennia. Some authors considered Neuroptera as one of the orders of superorders Neuropteroidea which also includes the orders Megaloptera and Raphidioptera. In the first case, the concept neuroptera includes Megaloptera. In the second case it does not. In order to avoid confusion, it has been thought better to follow Imms (1925) in dividing Neuroptera into two suborders, namely, Planipennia and Megaloptera.

Hypognathus head, a comb-like ramification of radial sector and terminal twiggings of the longitudinal wing veins at margin in most of the families are salient features of Planipennia. But in Megaloptera the prognathus head, a few additional branches of radial sector, rare bifurcation of the branches of longitudinal veins at wing margin are characters separating this suborder from Planipennia.

The order Neuroptera as conceived in the present paper comprises of about twenty two families with about 5000 species from the world. Those families are Corydalidae, Sialidae*, Raphididae*, Inocellidae, Ithonidae*, Coniopterygidae, Dilaridae, Berothidae, Polystoechotidae*, Sisyridae, Hemerobiidae, Psychopsidae*, Neurorthidae*, Osmylidae, Mantispidae, Chrysopidae, Myiodactylidae*, Nymphidae*, Stilbopterygidae*, Nemopteridae, Myrmeleontidae and Ascalaphidae. A total of about 335 species in 13 families (except those marked with asterisk*) of Neuroptera are known from India of which 128 species in 69 genera and 11 families are being reported from North-East India.

SYSTEMATIC ACCOUNT

Key to suborders of order NEUROPTERA

Branches of veins usually bifurcated at margin of wings; Rs generally with numerous branches. ..... PLANIPENNIA

Branches of veins rarely bifurcated at margin of wings; Rs with a few additional branches. ..... MEGALOPTERA

Suborder I. PLANIPENNIA

Head : hypognathus, free. Compound eyes : Large and widely separated. Ocelli : absent or 3 in Osmylidae and Dilaridae. Antenna : variable; short or long; setiform, filiform, moniliform,

pectinate, clubbed or clavate, often many segmented. Mouth parts : typically biting. Prothorax : short or elongate. Wing : usually similar in size and shape; transparent or cloudy or covered with fine whitish powdery wax in Coniopterygidae; variable in a few groups; held roof-like over body at rest; venation : variable but usually many longitudinal and crossveins present; veins frequently abundant. Forewing : veins forked on hind margin; Rs generally with numerous branches but in Coniopterygidae with two branches only. Hindwing : without separated anal area. Leg : short and usually slender; tibia generally with spur; tarsi 5 segmented and usually with a pair of claws. Abdomen : 10 segmented; genitalia : male with a pair of gonocoxites on 9th sternite and single hypandrium; female with a pair of gonapophyses.

Key to families of suborder PLANIPENNIA

1. Wings and most of the body covered with whitish waxy powder; costal area without or with only one or two crossveins near root; veins without terminal twiggings. ..... Coniopterygidae
- Wings and body not covered with whitish powder; costal area with many crossveins; usually with terminal twiggings. 2
2. Antenna moniliform or filliform rarely pectinate, never clubbed, nor with thickened apex. 3
- Antenna gradually thickened towards apex, or filiform with thickened apex. 8
3. Foreleg normal and cursorial, prothorax short. 4
- Foreleg raptorial, with strongly thickened femur; prothorax usually greatly elongated; antenna short; wings narrow. ..... Mantispidae
4. Forewing with 2 or more apparent sectors arising from R. 5
- Forewing with only a single sector arising from R near its base. 6
5. Antenna in both sexes moniliform; ovipositor not exserted; cross veins a few; ocelli absent. ..... Hemerobiidae
- Antenna in males pectinate, in females otherwise; ovipositor exserted and long; vertex with 3 prominent ocellus-like tubercles; cross veins numerous. ..... Dilaridae
6. Ocelli present; discal area of wings with many cross veins. ..... Osmylidae
- Ocelli absent; discal area of wings not with many crossveins. 7
7. Costal crossveins forked in forewing; Cu_1 in hindwing running for a long distance close to hind border. ..... Berothidae
- Costal crossveins usually not forked in forewing, Cu_1 in hindwing not parallel to hind margin, wing margins without trichosors. ..... Chrysopidae
8. Antenna short, weakly clubbed or flattened towards apex; Hsc elongate. .... Myrmeleontidae
- Antenna long and slender, strongly clavate apically; Hsc not elongated and differentiated. .. .. Ascalaphidae

Family A. CONIOPTERYGIDAE

The coniopterygids are popularly called "dusty wings." They are very small insects in the suborder Planipennia but are most valuable allies of man in checking pests of insects and mites. Both imagines and larvae live on small inactive creatures, namely aphids, coccids and mites which are very injurious pests of agri-horticultural plants.

Diagnostic characters :

Small sized insect. Body, wings and legs covered with whitish or light greyish waxy substance. Head : hypognathus. Antenna : moniliform. Mouthparts : mandible rather small; maxillae with 5 segmented palpi and labium with 3-segmented palpi. Legs : slender; tarsi 5-segmented. Wings : two pairs, subequal. Forewing : (Pl. 10, fig. 1) : costa much reduced; subcosta distally furcate; radial sector leaving radius near middle. Hindwing : costa much reduced. Abdomen : weakly sclerotised; ninth tergite and sternite are generally fused into a synscleritous well-sclerotised ring.

Key to subfamilies of the family CONIOPTERYGIDAE

Forewing with a single radio-medial crossvein at middle; Rs branching off from R at a distance from base of hindwing; galea with single segment; abdomen without plicature. ..... Coniopteryginae

Forewing with a couple of radio-medial crossvein at middle; Rs branching off from R near base of hindwing; galea with three segments; abdomen with plicaturae. ..... Aleuropteryginae

Subfamily a. CONIOPTERYGINAE

This subfamily is divided into two tribes, namely, Coniopterygini and Conwentzini.

Key to tribes of subfamily CONIOPTERYGINI

Gonarcus present or obliterate; in latter case, styli apparently arising from ventral part of ectoproct. ..... Coniopterygini

Gonarcus obliterate, styli when present, arising from sclerotised ring of 9th segment. ..... Conwentzini

Tribe i. CONIOPTERYGINI

Only a single genus, namely, Coniopteryx is represented in N.E. India.

Genus 1. ***Coniopteryx*** Curtis

1834. *Coniopteryx* Curtis, *British Entomology*, Text to pl. 528.

1836. *Malacomyza* Wesmael, *Bull. Acad. Roy. Brux.*, **3** : 166.

1840. *Sciodus* Zetterstedt, *Insecta Lapponica* : 1050.

1856. *Aleuronia* Fitch, *First and second report on the noxious, benificial and other insects of the State New York* : 96.

1910. *Deasia* Navas & Marcet, *Rev. Montserratina* : 150.

1972. *Coniopteryx,* Meinander, *Acta Zool. Fennica,* **136** *: 193.*

Type species : Coniopteryx tineiformis Curtis

Diagnostic features : Antenna : flagellar segments in male broader than female; hairs arranged in two whorls. Thorax : with distinct shoulder spots. Forewing : membrane unspotted; Rs and M forked; Rs forking off from R in basal part; distal crossvein R_1-R_{2+3} always present. Hindwing : unspotted membrane; Rs branched but M unbranched; crossvein R_{4+5}-M usually absent. Abdomen : pale and weakly sclerotised; with wax glands upto seven segments; ectoprocts weakly sclerotised. Male genitalia : gonarcus with styli (entoprocessus); hypandrium large; parameres prominent and with a distinct ventral tooth at middle; penis bilobed. Female genitalia : weakly sclerotised.

Distribution : World-wide.

Remarks : Meinander (1972) placed the species of *Coniopteryx* under six subgenera, namely, *Scotoconiopteryx, Metaconiopteryx, Xeroconiopteryx, Protoconiopteryx, Holoconiopteryx,* and *Coniopteryx* s.str. of which the last one is dealt with here.

Subgenus ***Coniopteryx*** Curtis

1834. Coniopteryx Curtis, British Entomology : 528.

1972. Coniopteryx Meinander, Acta Zool. Fennica, **136** : 236.

Diagnostic features : Wing membranes light. Male genitalia : gonarcus and hypandrium discleritus; base of styli attached to gonarcus at apex; gonarcus divided into two lateral plates. Female genitalia : gonapophysis lateralis not fused.

Geographical range : On all the continents of the globe.

Remarks : Two species of this subgenus are reported here.

Key to species of the subgenus ***Coniopteryx***

Median apical incision of hypandrium atleast as deep as half the breadth of hypandrium. ... . *ambigua* Withycombe

Median apical incision not deeper than a third the breadth of hypandrium. .... *exigua* Withycombe

1. ***Coniopteryx (Coniopteryx) ambigua*** Withycombe

1925. *Coniopteryx ambigua* Withycombe, *Mem. Dept. Agric. India,* **9** : 13.

1939. *Malacomyza ambigua* Withycombe. Banks, *Bull. Mus. Comp. Zool.,* **85** : 474.

1938. *Niphadicera terminalis* (Part) Banks, *J. Fed. Malay States Mus.,* **18** : 231.

1968. *Coniopteryx withycombei* Tjeder, *Ent. Tidskr.,* **89** : 145.

1990. *Coniopteryx (Coniopteryx) ambigua*, Meinander, *Acta Zool. Fennica*, **189** : 52.

Diagnostic characters : Vide key.

Material examined : 5 exs., India, Meghalaya, East Garo Hills, Tasek Forest Rest House, vill. Nafa, 3.vii.1988; Rongrengiri Reserve Forest near F.R.H. farm; 8.vii.1988; West Garo Hills, Chhambal, Badmagri, 1 km. east of Sibbari P.W.D. Bungalow, 15.vii.1988 (Coll. R.K. Ghosh and party). Shillong, Elephanta Falls, 30.iii.1991; Maujrang, 20 kms. from Shillong, 4.iv.1991 (Coll. S.K. Ghosh and party).

Distribution : India : Meghalaya, Assam, Bihar, Uttar Pradesh and Tamil Nadu : Nilgiris, Palni Hills. Elsewhere : Sri Lanka & Malaya.

2. ***Coniopteryx (Coniopteryx) exigua*** Withycombe

1925. Coniopteryx exigua Withycombe, Mem. Dept. Agric. India, **9** : 12.

1925. Coniopteryx pusana Withycombe, Mem. Dept. Agric. India, **9** : 14.

1990. Coniopteryx (Coniopteryx) exigua, Meinander, Acta Zool. Fennica, **189** : 52.

Diagnostic features : Head : greyish yellow; no hook on frons. Antenna : brown but lighter towards apex, scale-like hairs apically on pedicel and flagellar segments; ordinary hairs in two regular whorls. Thorax brown with dark brown shoulder spots. Wings : light greyish-brown. Male genitalia : median apical incision not deeper than a third the breadth of hypandrium.

Material examined : 1 ex., India, Meghalaya, East Garo Hills, Rongrengiri Reserve Forest, near F.R.H. Farm, 8.vii.1988 (coll. R.K. Ghosh and party).

Distribution : India (Jammu & Kashmir; Bihar; West Bengal; Meghalaya). Elsewhere : Nepal, Pakistan.

Remarks : Meinander (1972) considered both the Indian species *Coniopteryx pusana* Withycombe and *Coniopteryx exigua* Withycombe as conspecific.

Tribe ii. CONWENTZINI

Genus 2. ***Conwentzia*** Enderlein

1905. *Conwentzia,* Enderlein, *Westpreuss. Bot. Zool. Ver. Ber.,* **26/27** : 10.

1972. *Conwentzia*, Meinander, *Acta Zool. Fennica*, **136** : 294.

Type species : *Conwentzia pineticola* Enderlein

Diagnostic characters : Antenna : with numerous segments (30-57 segmented). Forewing : Rs and M forked; two basal crossveins between c - Sc; Rs forking from R in apical part of wing; membrane unspoted. Hindwing : fully developed or reduced; Rs and M unforked. Abdomen : weakly sclerotised. Male genitalia : strongly selerotised; ectoprocts with large digit-like processes ventrally; parameres with a dorsal tooth apically.

Distribution : Holarctic region, Oriental (Northern India), Ethiopian region (South Africa).

Remarks : Only a single species is dealt with here from North-East India.

3. ***Conwentzia inverta*** Withycombe

1925. *Conwentzia inverta* Withycombe, Mem. Dept. Agric. India, (Ent. Ser.) **9** : 10.

1972. *Conwentzia inverta*, Meinander, Acta Zool. Fennica, **136** : 299.

Diagnostic characters : Antenna : scape and pedicel light brown; flagellum dark brown. Forewing : membrane tinged with fuscus. Hindwing : reduced. Male genitalia : outer process of ectoproct almost square in lateral view; paramere with a dorsal process anteriorly at tip.

Material examined : 1 ex. India, Meghalaya, West Garo Hills, Badmagiri, 1 km. west of Sibbari Inspection Bunglow, 15.vii.1988 (Coll. R.K. Ghosh and party).

Distribution : India (Meghalaya and Bihar).

Subfamily b. ALEUROPTERYGINAE

This subfamily is divided into three tribes, namely, Fontenelleini, Aleuropterygini and Coniocompsini of which the last two tribes are dealt with.

Key to tribes of subfamily ALEUROPTERYGINAE

Hairs in antennal segments irregularly arranged; wings rather broad with very short marginal fringes; stem of Cu in forewing short; Cu_2 connected with Cu_1 by a crossvein or with A_1 by two crossveins; 9th segment of male completely withdrawn into 8th segment. ..... Aleuropterygini

Hairs in antennal segments arranged in two whorls; wings narrow with long marginal fringes; stem of Cu in forewing rather long; Cu_2 not connected with Cu_1 or A_1 by crossvein; 9th sternite of male external. ..... Coniocompsini

Tribe I. ALEUROPTERYGINI

Genus 3. ***Heteroconis*** Enderlein

1905. *Heteroconis* Enderlein, *Zool. Anz.*, **29** : 226.

1925. *Niphadocera* Withycombe, *Mem. Dept. Agric. India*, **9** : 6.

1973. *Drepanoconis* Tjeder, *Ent. Tidskr.*, **93** : 204.

1972. *Heteroconis*, Meinander, *Acta Zool. Fennica*, **136** : 59.

Type species : *Heteroconis ornata* Enderlein.

Diagnostic features : Antenna : usually 18-segmented; pedicel of male without spine; often bicilorous. Frons : partly unsclerotised; a horn usually present. Wings : M forked in both wings; Forewing : anterior branch of forewing either coalescing or connected by crossvein with R_{4+5}; median setae arising from two distinct thickenings. abdomen : with distinct plicaturae on segments 5-6. Male genitalia : strongly sclerotised, internal and with caudal parts protruding from abdomen; penis prominent and with two dorsolateral and one unpaired conical anterior apodeme. Female genitalia : weakly sclerotised.

Geographical range : Australia and South Asia.

4. ***Heteroconis terminalis*** (Banks)

1913. *Malacomyza terminalis* Banks, *Trans. Amer. Ent. Soc.*, **39** : 220.

1925. *Niphadocera terminalis* Withycombe, *Mem. Dept. Agric. India*, **9** : 6.

1990. *Heteroconis terminalis* Meinander, *Acta Zool. Fennica*, **189** : 9.

Diagnostic features : Antenna : basal and terminal segments of flagellum whitish but middle segments dark brown in males; basal flagellar segments longer than broad but apical ones as long as broad in males but in females all segments are as long as broad. Wings : membrane of both wings unicolorous, pale with slight brownish tinge. Forewing : basal crossvein Rs - M between median thickenings. Male genitalia : 9th sternite of male very narrow and anteriorly prolonged into 4th segment. Female genitalia : ductus receptaculi sclerotised and running from caudal part of abdomen to 4th segment.

Material examined : 3 exs., India : Meghalaya, East Garo Hills, Rongrengiri Reserve forest, Near Forest Rest House, 8.viii.1988; Rongrengiri Reserve Forest, 1 km. from F.R.H., 9.viii.1988; West Garo Hills, Chhombal, Badmagiri, 1 km. east of Sibbari P.W.D. Bungalow, 15.vii.1988 (Coll. R.K. Ghosh and party).

Distribution : India (Maharashtra, Karnataka, Meghalaya). Elsewhere : Malay.

Tribe II. CONIOCOMPSINI

Genus 4. ***Coniocompsa*** Enderlein

1905. *Coniocompsa* Enderlein, *Wien. Ent. Ztg.*, **24** : 225.

1972. *Coniocompsa,* Meinander, *Acta Zool. Fennica,* **136** : 91.

Type species : Coniocompsa vesiculigera Enderlein.

Diagnostic characters : Antenna : short (16-21 segmented). Forewing (pl. 10, fig. 1) : membrane with markings; Sc and R basally not connected by crossvein; Rs basally sinuous with a distinct knee; M with large thickenings which bear long setae; M usually unforked; a crossvein connecting stem of Cu with A_1. Abdomen : with plicaturae on segments 3-5 in both sexes. male genitalia : with a thick tubelike penis and a pair of parameres. Female genitalia : gonapophysis lateralis with a pair of long curved setae.

Distribution : From the Hawaiian Islands in the east to Cape Verde Islands in the west.

Remarks : Only a single species is dealt herewith from North-East India.

5. ***Coniocompsa indica*** Withycombe

1905. *Coniocompsa indica* Withycombe, *Mem. Dept. Agric. India,* **9** : 9.

1990. *Coniocompsa indica,* Meinander, Acta Zool. Fennica, **189** : 21.

Diagnostic features : Head : fuscous. Eyes : blackish. Palpi : pale brown. Thorax : fuscous with diffuse brown shoulder spots. Forewing (pl. 10, fig. 1) : greyish brown spots at end of longitudinal veins Sc_1 - Cu_2 and surrounding distal crossveins; two large median bristles on dark brown prominences of the vein. Hindwing : membrane hyaline. Male genitalia : ectoprocts slightly sclerotised; 9th sternite dorsally angular posteriorly; penis broad; styli short; a paired simple falcate structure dorsally of penis.

Material examined : 2 exs. India : Meghalaya, Shillong, Botanical Garden, 1400 m. 29.iii.1991; near Elephanta Falls, 1700 m., 30.iii.1991 (Coll. S.K. Ghosh and party).

Distribution : India (Tamil Nadu, Bihar, West Bengal, Meghalaya). Elsewhere : Sri Lanka.

Family B. MANTISPIDAE Westwood

The mantispids look like mantids of Dictyoptera. The characteristics anterior legs of this family distinguish them from all other families. The biology is very interesting as the larvae are parasites of hymenoptera and spiders and have a complicated development, hypermetamorphosis.

Diagnostic Characters : Antenna : very short and moniliform; seldom longer than head. Prothorax : extremely long, often longer than rest of body and dilated anteriorad; with prominent sulci and tubercles. Wing (Pl. 10, fig. 2) : elongate and narrow; costal field reduced in both wings, sometimes absent; pterostigma united with fused Sc and R; in genus *Mantispa* only one row of

discal cells present in both wings. Leg : forelegs raptorial; coxae long; femur much enlarged with long spines on ventrolateral margin; tibia and tarsus thin and these as long as or shorter than femur.

Key to genera of the family MANTISPIDAE

Radial cells of both wings long and narrow; Cu in hindwing not bending down towards 1A; both Cu and 1A being connected with a cross vein; prothorax short and stout. .... *Climaciella* Enderlein

Radial cells of both wings wide and somewhat angulated; prothorax slender; Cu in hindwing bending down towards 1A, either touching 1A or connected with it by a short cross vein. . ..... *Mantispa* Illiger

Genus 5. ***Climaciella*** Enderlein

1910. *Climaciella* Enderlien, *Stettin. ent. Ztg.*, **71** : 360.

1910. *Climaciella*, Okamoto, *Zool. Mag.*, **22** : 539.

1912. *Climaciella*, Nakahara, *Ibid.*, **24** : 561.

1913. *Climaciella*, Nakahara, *Annotnes Zool. Jap.*, **8** : 232.

1913. *Climaciella*, Banks, *Trans. Am. ent. Soc.*, **39** : 206.

1925. *Climaciella*, Kuwayama, *J. Coll. Agr. Hokkaido Imp. Univ.*, **15** : 259.

1977. *Climaciella*, Ghosh & Sen, *Rec. zool. Surv. India*, **72** : 282.

Type species : Mantispa brunnea Say

Diagnostic Characters : Prothorax : short and stout; radial cells of both wings long and narrow; Cu in hindwing not bending down towards anal, both being connected by a crossvein; 2A not forked; fore coxa entire; fore tarsus with two claws.

Distribution : Africa, China, India, Indonesia, Insulinde, Japan and Malay Archipelago.

6. ***Climaciella quadrituberculata*** (Westwood)

1892. *Mantispa quadrituberculata* Westwood, *Trans R. ent. Soc. Lond.*, (N.S.Z.) **1** : 264.

1909. *Ditaxis 4-tuberculata* Navas, *Mem. R. Acad. Cienc. Art. Barcel.*, **7** : 474.

1910. *Climaciella 4-tuberculata* Enderlein, *Stettin. ent. Ztg.*, **71** : 361.

1910. *Climaciella miyakei* Okamoto, *Zool. Mag.*, **22** : 541.

1910, *Climaciella habutsuella* Okamoto, *Ibid.*, : 542.

1927. *Climaciella satsumensis* Yazaki, *Tohoku Imp. Univ. Sci. Rep.*, **(4)2** : 361.

1927. *Climaciella tanegashimensis* Yazaki, *Ibid.* : 363.

1962. *Climaciella quadrituberculata* Kuwayama, *Pacific Insects*, **4**, no. 2 : 379.

Diagnostic characters : Head : orange yellow; shining black line on face, between antennae and also on vertex. Antenna : black with yellow base and apex. Pronotum : yellow anteriorly with black margin and a brown transverse fascia posteriorly. Meso- and metanotum : yellow. Legs : reddish brown; femur of foreleg with a large black spot at inner side; tibiae of mid- and hind pair of legs yellowish white; claws with 4 teeth at end. Wings : suffused with pale brownish on costal, subcostal and radial areas of both wings and at base of forewing; a conspicuous fulvous band on apical areas of both wings. Abdomen : tergites yellow but hind borders of both third and fourth tergites black.

Material examined : 1 ex., : India : West Bengal, Darjeeling, Singla, 1500 ft., vi.1913 (coll. Lord Carmichael's collection).

Distribution : India (Assam, N. Bengal, Himachal Pradesh : Kulu). Elsewhere : Japan, Taiwan, Philippines, vietnam, Java.

Genus 6. ***Mantispa*** Illiger

1798. *Mantispa,* Illiger, Kugelann, *Verseichniss der Kafer Preussens* Gebauer, Halle : 499.

1839. *Mantispa,* Burmeister, *Handbuch der Entomologie*, **2**(2) : 965.

1866. *Mantispa*, Hagen, *Stettin. ent. Ztg.*, **27** : 375.

1888. *Mantispa*, Rostock, *Ver. Naturk Zwicku, Jahresh*, 1887 : 115.

1909. *Mantispa*, Van der Weele, *Notes Leyden Mus.*, **31** : 87.

1910. *Mantispa*, Enderlein, *Stettin. ent. Ztg.*, **71** : 344.

1910. *Mantispa*, Okamoto, *Zool. Mag.*, **22** : 534.

1912. *Mantispa*, Nakahara, *Zool. Mag.*, **24** : 559.

1913. *Mantispa*, Nakahara, *Ibid.*, : 351.

1913. *Mantispa*, Nakahara, *Annotnes Zool. Jap.*, **8** : 230.

1913. *Mantispa*, Banks (in part), *Trans. Am. ent. Soc.*, : 206.

1925. *Mantispa*, Kuwayama, *J. Coll. Agr. Hokkaido Imp. Univ.*, **15** : 252.

1959. *Mantispa*, Handschin, *Rev. Zool. Bot. Afr.*, **59** : 198.

1977. *Mantispa*, Ghosh & Sen, *Rec. Zool. Surv. India*, **73** : 282.

Type species : Mantispa styriaca Poda

Diagnostic characters : Prothorax : slender. Wing : Radial cells of both wings wide and somewhat angulated and with two cross veins which form 3 radial cells; Cu in hind wing bending down towards anal, touching anal or connected with it by a very short cross vein; pterostigma short. Male genitalia : appendix superiores strong; penis long, slender and curved at tip; hypandrium short.

Distribution : Africa, America, Australia, China, India, Indonesia, New Guinea, The Philippines, Russia, Sri Lanka and Taiwan.

Remarks : There are three species reported from India, all of which are dealt with here.

Key to species of the genus ***Mantispa***

1. Antenna brown; prothorax short and nodose; costal region of forewing brownish yellow. .... *nodosa* Westwood

- Antenna black atleast in some segments; prothorax elongate; costal region of forewing not brownish yellow. 2

2. Antenna black except two basal segments; prothorax with two brown lines but without transverse ridges; vertex with a transverse brown stripe. ..... *indica* Westwood

- Antenna with two basal segments black; prothorax without brown lines but with transverse ridges; vertex without brown stripe. ..... *rugicollis* Navas

7. ***Mantispa nodosa*** Westwood

1848. *Mantispa nodosa* Westwood, *Cabinet Orient. Ent.*, 70.

1852. *Mantispa nodosa*, Westwood, *Trans. R. ent. Soc. Lond.*, (N.S.) **1** : 256.

1977. *Mantispa nodosa*, Ghosh and Sen, *Rec. Zool. Surv. India*, **72** : 283.

Diagnostic characters : Colour : black. Antenna : brown. Prothorax : short and nodose. Wings (forewing : pl. 10, fig. 2); subhyaline; costal half of forewing yellow; base brown; an oblique brown band before middle of forewing. Legs : brown. Abdomen : dorso-medially yellowish.

Material examined : 1 ex. ♀ : India : Meghalaya, West Garo Hills, Shibbari P.W.D. bungalow, 14.vii.1988 (coll. R.K. Ghosh and party).

Distribution : India (Meghalaya and Assam).

Remarks : The species is for the first time recorded from Meghalaya.

8. ***Mantispa indica*** Westwood

1852. *Mantispa indica* Westwood, *Trans. R. ent. Soc. Lond.*, (N.S.) **1** : 268.

1933. *Mantispa indica*, Banks, *Indian Forest Rec.*, (18)**6** : 2.

1977. *Mantispa indica*, Ghosh & Sen, *Rec. zool. Surv. India*, **22** : 283.

Diagnostic characters : Head : yellow. Labrum : blackish-brown. Antenna : black. except two yellow basal segments. a brown line between antennae extending nearly to labrum. Vertex : with a transverse brown stripe. Prothorax : yellow with two brown lines anteriorly; postero-lateral part brown. Leg : femur of fore leg with a small black spot at tip anteriorly and blackish brown at the inner side; mid- and hind pair of legs yellow with black claws, each terminated by three or four teeth. Wings : hyaline; veins black; radius yellow; pterostigma elongate and red; with 7-8 oblique discoidal cells. Abdomen : varied with yellow and black.

Material examined : 3 exs., India, Meghalaya, East Garo Hills, Songsok, Tasek Forest Rest House, 3.iii.1988 (coll. R.K. Ghosh and party); West Bengal, Darjeeling, 1500 ft., vi.1913 (Lord Carmichael's collection); Sikkim (no other data).

Distribution : India (West Bengal : Calcutta and Darjeeling; Meghalaya; Sikkim; Assam; Western Himalaya; Karnataka).

Remarks : Ghosh (in press) recorded the species from Meghalaya and this is for the first time recorded from Sikkim.

9. ***Mantispa rugicollis*** Navas

1905. *Mantispa rugicollis* Navas, *Bol. Soc. Aragon*, **4** : 54.

1909. *Mantispa rugicollis*, Needham, *Rec. Indian Mus.*, **3** : 75.

1977. *Mantispa rugicollis*, Ghosh and Sen, *Rec. zool. Surv. India*, **72** : 284.

Diagnostic characters : Antenna : two basal segments black. Vertex : yellow. Frons : black. Clypeus : brownish. Maxillary palpi : yellow. Labial palpi : yellow but darkbrown at tip. Prothorax : long, blackish with transverse ridges and furrows. Meso- and Metathorax : blackish. Wings : hyaline; costa, subcosta and radius yellow; all other veins darkbrown; pterostigma red; with more than ten discoidal cells. Legs : brown. Abdomen : blackish.

Material examined : 1 ex. (Damaged) : India, Sikkim, date nil (coll. Knyvett).

Distribution : India (Himalaya; Assam, Sikkim).

Remarks : The specimen preserved in dry condition in the National Zoological Collections of Zoological Survey of India is badly damaged.

Family C. HEMEROBIIDAE Leach

Diagnostic characters : Adults : small to medium sized with forewing about 3-16 mm in length. Head : with prominent compound eyes. Antenna : slender, multisegmented and moniliform. Mandible : well developed, acutely pointed, somewhat asymmetrical, always with internal tooth. Pronotum : short, usually much broader than long with lateral margin usually prolonged into a lobe. *Mesonotum* : large, broad and with a large scutellum. Metanotum : shorter than mesonotum with a small scutellum. Wing : shape variable; generally oval or elongate, subequal; trichosors always present on wing margin; pterostigma generally distinct; venation extremely variable. Forewing (Pl. 12, fig. 1) : R_1 with more than one sector; with jugal lobe at base of anal margin. Hindwing (Pl. 12, fig. 2) : with distinct frenulum. Leg : cursorial with well developed coxa; tibia usually with short spur; tarsus 5-segmented with curved claws and a broad pad-like empodium. Abdomen : cylindrical or nearly so, generally more slender in male and female. Male genitalia (Pl. 14, figs. 14-16) : a transverse arch-shaped gonarcus either with a mediuncus or an arcessus or a pair of entoprocessus (or two of these structures); parameres free or fused; a distinct stem-like hypandrium internum present. *Female genitalia* : subgenital present or absent; spermatheca usually small, weak, structurally simple or sometimes coiled.

Key to genera of the family Hemerobiidae

1. Ectoproct with catoprocessus 2
- Ectoproct without catoprocessus. ..... *Drepanacra* Tillyard
2. Ectoproct with free catoprocessus, carrying a fan-like group of setae in males. ..... *Psectra* Hagen
- Ectoproct of male without free catoprocessus. 3
3. Paremeres fused basally. 4
- Parameres not fused. ..... *Hemerobius* Linnaeus
4. Gonarcus with arcessus. 5
- Gonarcus without arcessus. ..... *Neomicromus* Ghosh
5. Gonarcus with a pair of dorsal lobes over arcessus. ..... *Neuronema* MacLachlan
- Gonarcus with a single dorsal process over arcessus. ..... *Micromus* Rambur

Genus 7. ***Drepanacra*** Tillyard

1916. *Drepanacra* Tillyard, *Proc. Linn. Soc. N.S.W.*, **41** : 293.

1922. *Menopteryx* Krüger, *Stettin. ent. Ztg.*, **83** : 170.

1940. *Drepanacrella* Kimmins, *Ann. Mag. nat. Hist.*, (11)**6** : 222.

1993. *Drepanacra* Oswald, *J. Newyork Entomol. Soc.*, **101**(2) : 237.

Type species : *Drepanepteryx humilis* MacLachlan

Diagnostic characters : Forewing : falcate; costal gradate veinlets incomplete; only two complete series of gradate crossveins. Hindwing : with Cu_2; outer gradate series complete but inner series represented by a few crossveins. Male genitalia : ectoproct elongate without process or projection; aedeagus single, very large; paramere basally fused, distally bifurcate and each distal lobe composed of a subapical spinose process superposed over a small ventral lobe.

Distribution : South East Asia; Australia; New Zealand; several islands of South-West Pacific.

Remarks : Oswald (1993) synonymised *Drepanacrella* Kimmins with *Drepanacra* Tillyard with some valid interpretation. Therefore the single species from India namely, *Drepanacrella khasiana* Kimmins is considered under the genus *Drepanacra* Tillyard.

*10. ***Drepanacra khasiana*** (Kimmins)

1940. *Drepanacrella khasiana* Kimmins, *Ann. Mag. nat. Hist.*, (11)**6** : 222.

1990. *Drepanacrella khasiana*, Monserrat, *Proc. third. International Symp. on Neuropterology* : 218.

1993. *Drepanacrea khasiana* Oswald, *J. New York Entomol. Soc.*, **101**, no. 2 : 238.

Diagnostic characters : Head : tawny; face shining; genae brownish. Pro-, meso-, and metanotum : brownish yellow. Forewing : apex falcate; membrane irrorated with pale brownish, variably marked with dark brown in the form of a streak along inner gradate series and hind margin and also as spots on some outer gradate series and on Cu_1; some transverse bands on costal area; six branches to Rs; 9 veins in inner and 13 in outer gradate series. Hindwing : subacute, scarcely falcate; membrane clouded at base of pterostigma, some outer gradate veins, on apical third of median and fork of cubitus; 4 gradates in inner and 10 gradates in outer series. Male genitalia(Pl. 14, figs. 6-7) : ectoprocts elongate being directed downward; gonarcus with a narrow dorsal arch, side lobes bent downwards at right angles; arcessus consisting of two chitinous plates; parameres long, fused except at apex which is acute and with an expansion resembling an axe.

Distribution : India (Meghalaya : Khasi Hills).

Remarks : The species was originally described by Kimmins (1940) from Khasi Hills, Meghalaya (not 'Assam' as referred to by Kimmins) under the genus *Drepanacrella* Kimmins. But Oswald (1993) has placed it in *Drepanacra* Tillyard as he has opined that the characters of male terminalia of *D. Khasiana* are not sufficient to justify its generic separation from *Drepanacra*. As the material is not available for study, it is not possible to make further comment.

Genus 8. ***Psectra*** Hagen

1866. *Psectra* Hagen, *Stettin. ent. Ztg.*, **27** : 376.

1909. *Annandalia* Needham, *Rec. Indian Mus.*, **3** : 208.

1928. *Eucarobius* Esben-Petersen, Neuroptera. In : *Insects of Samoa and other Samoan terrestrial Arthropoda*. Fasc. **3**, part vii, p. 95.

1960. *Kimminsiella* Nakahara, *Mushi*, **34** : 14.

1993. *Psectra*, Oswald, *J. New York Entomol. Soc.*, **101**(2) : 230.

Type species : *Hemerobius diptera* Burmeister

Diagnostic characters : Forewing : oval; costal area varying in width (the Indian *Annandalia* is a *Psectra* with broad costal area); humeral vein distinct, usually forked and more or less recurrent; several costals forked; Sc and R wide apart with several crossveins between them; with two Rs branches; a single row of gradate series. Male genitalia : ectoproct with articulated catoprocessus bearing a row of terminal modified setae; gonarcus more or less arch formed, transverse structure; parameres completely fused.

Distribution : The genus is distributed in North America, Europe, temperate Asia, sub-saharan Africa, India, Sri Lanka, tropical areas of South-East Asia, Australia and several islands in South-Western Pacific.

11. ***Psectra iniqua*** (Hagen)

1859. *Hemerobius iniquus* Hagen, *Verh. zool. bot. Ges. Wien.*, **9** : 208.

1909. *Annandalia curta* Needham, *Rec. Indian Mus.*, **3** : 208-209.

1910. *Notiobiella maindronina* Navas, *Broteria (Ser. Zool.)*, **9** : 70.

1930. *Notiobiella khandalensis* Navas, *Mem. Acad. Nuovi Lincei*, (2)**14** : 422.

1966. *Psectra iniqua* Tjeder, *South African Animal life*, **8** : 329.

Diagnostic characters : Head : blackish brown; gena brown with a black stripe on each; palpi blackish. Forewing : oblong, obtusely rounded at both ends; membrane hyaline richly irrorated with brownish dots and shadings; a distinct tri-radiate spot at base of Rs. three darker areas present - one at base of wing extending to base of Rs, second across base of second radial sector running from fore- to hind margins of wing and a third encircling wing apex; costal space broad at base; humeral vein forked; costals brown; Sc pale; other longitudinal veins pale and brown alternately; second Rs branch proceeding from R before pterostigma; a single series of gradate crossveins clouded with brown. Hindwing : largely hyaline; slightly infuscated on costal area and in marginal forks. Legs : pale brown. Abdomen : blackish brown. Male genitalia : ectoproct with articulated catoprocessus bearing a row of terminal setae; gonarcus with a pair of long projections distally; parameres fused into a long, slender distal part, basally dillated with upturned margin.

Material examined : 1 ex. (♂) : India, West Bengal. Darjeeling dt., Siliguri, Millanpalli, 1.x.1996 (coll. S.K. Ghosh).

Distribution : India (West Bengal : Calcutta and Darjeeling dt.; Bihar). Elsewhere : Sri Lanka, Thailand.

Remarks : The species is for the first time recorded from North-East India though it was reported in different names from different localities in India (*vide* Synonym).

Genus 9. ***Hemerobius*** Linnaeus

1758. *Hemerobius* Linnaeus, *Systema Naturae, 10th Ed.*, : 549.

1936. *Egnyonyx* Wesmael, *Bull. Acad. R. Sci. Belles-Lett. Brux.*, **3** : 167.

1842. *Mucropalpus* Rambur, *Hist. Nat. des Insectes, Nevropteres* : 420.

1906. *Stenolomus* Navas, *Rev. R. Acad. Cience. exact. fis. nat. Madr.*, **4** : 701.

1909. *Hemerodomia* Navas, *Ann. Soc. Sci. Bruxelles*, **33** : 217.

1922. *Brauerobius* Krüger, *Stettin. ent. Ztg.*, **83** : 171.

1922. *Hagenobius* Krüger, *Ibid.*, 171.

1922. *Reuterobius* Krüger, *Ibid.*, : 171.

1922. *Schneiderobius* Krüger, *Ibid.* : 171.

1928. *Anotiobiella* Kimmins, *EOS, Madr.*, **4** : 364.

1940. *Allemerobius* Banks, *Proc. U.S. Natn. Mus.*, **88** : 183.

1961. *Dyshemerobius* Tjeder, *South African Animal Life*, **8** : 352.

1961. *Mesohemerobius* Nakahara, *Kontyu*, **34** : 202.

1983. *Semohemerobius* Yang, *Entomotaxonomia*, **5** : 128.

1985. *Monorobius* Makarkin, *Ent. Obozr.*, **64** : 167.

1988. *Hemerobius* Monserrat, *Proc. 3rd International Symp. on Neuropterology* : 219.

1993. *Hemerobius*, Oswald, *J. New York entomol. Soc.*, **101**(2) : 213.

Type species : *Hemerobius humulinus* Linn.

Diagnostic characters : Forewing : with recurrent humeral veinlets; R generally with 3 sectors; 2 complete series of gradate crossveins. Hindwing : forking of M far beyond origin of first radial sector; one complete series of outer gradates; Cu_2 completely atrophied. Male genitalia : ectoproct with spinous projection; aedeagus paired; parameres not fused.

Distribution : This genus has representatives in all major regions of the globe except Australia and Oceania. Africa; America; Asia (Afghanistan, Baluchistan, China, India, Java, Japan,Kamchatka, Lebanon, Malay, Sri Lanka, Taiwan, Pakistan, The Philippines, Siberia, Sumatra, Syria, Tonkin) Atlantic islands; Comores; Europe except Iceland; Malagasy.

Key to species of the Genus ***Hemerobius***

Forewing with a broad ill-defined hyaline streak in discal area; fuscous cloud along anterior border of hyaline streak; ectoproct not forked in male. ..... *harmandinus* Navas

Forewing without hyaline streak in discal area and also fuscous cloud along anterior border; ectoproct forked in male. ..... *humulinus* Linn.

12. ***Hemerobius harmandinus*** Navas

1910. *Hemerobius harmandinus* Navas, *Rev. Russ. d'Ent.*, **9** : 395.

1915. *Hemerobius nitidulus* Nakahara (not Fabricius), *Ann. Zool. Jap.*, **9** : 32.

1916. *Hemerobius nakaharinus* Navas, *Mem. R. Acad. Cienc. Art. Barcelona., Septima Series*, **12** : 235.

1965. *Hemerobius harmandinus*, Kuwayama, *Pacific Insects*, **4**(2) : 354.

Diagnostic characters : Forewing (Pl. 13, fig. 5) : greyish brown with pale or dark streaks; with a broad ill-defined hyaline streak in discal area; fuscous cloud along anterior border of hyaline streak. Abdomen as in Pl. 13, fig. 6. Male genitalia (Pl. 13, fig. 7) : ectorpoct narrow beyond middle and slightly dilated at apex which ends in a single, small, internally directed tooth; processes of arcessus widely separated from each other.

Material examined : 36 exs. (♂♀) : India, Meghalaya, Shillong, in and around Elephanta Falls, 30.iii.1991; Quinton Road, 5.iv.1991; Charfarlong, 9.iv.1991; Polobazar, 10.iv.1991; Polo Hill forest, Near Mowra, 10.iv.1991 (coll. S.K. Ghosh). Cherrapunji, 28.x.1914 (coll. F.H. Gravely).

Distribution : India (Meghalaya). Elsewhere : Japan; Taiwan.

Remarks : The species is for the first time recorded from India including Meghalaya.

13. ***Hemerobius humulinus*** Linnaeus

1758. *Hemerobius humulinus* Linnaeus, *Syst. nat. Ed.* **10**, 1 : 550.

1761. *Hemerobius humuli* Linnaeus, *Faun. Succ.*, 381.

1895. *Hemerobius gossypii* Ashmead, *Ins. Life*, **7** : 27.

1924. *Hemerobius algonquinus* Banks, *Bull. Mus. comp. Zool.*, **65** : 429.

1954. *Hemerobius obtusus* Nakahara, *Kontyu*, **21** : 42.

1990. *Hemerobius humulinus* Monserrat, *Proc. Third International Symp. on Neuropterology* : 82.

1993. *Hemerobius humulinus* Oswald, *J. New York Entomol. Soc.*, **101**(2) : 214, figs. 33-40.

Diagnostic characters : Antenna : yellowish. forewing (Pl. 13, fig. 3) : gradate series of crossveins in forewing not margined; border along hind and outer margins with alternate pale and dark spaces with a spot between M_{3+4} & Cu_1. Abdomen (Pl. 13, fig. 4) : ectoproct rounded and small in female but ectoproct forked in male, the upper branch longer than lower and with a spur near apex.

Material examined : 3 exs. (♂♀) : India, Meghalaya, Shillong, Elephanta Falls, 30.iii.1991; Botanical Garden, Shillong, 29.iii.1991 (coll. S.K. Ghosh and party).

Distribution : India (Meghalaya). Elsewhere : Japan; Europe; North America.

Remarks : The species is for the first time recorded from India including Meghalaya.

Genus 10. ***Micromus*** Rambur

1842. *Micromus* Rambur, *Hist. Nat. des Insects, Nevropteres* : 416.

1899. *Nesomicromus* Perkins, Neuroptera, *In Fauna Hawaiiensis*, **2** : 37.

1899. *Pseudosectra* Perkins, *Ibid.* : 46.

1899. *Nesothauma* Perkins, *Ibid.* : 46.

1912. *Nenus* Navas, *Mems. R. Acad. Cienc. Artes Barcelona* (3)**10** : 199.

1915. *Eumicromus* Nakahara, *Annotnes Zool. Jap.*, **9** : 36.

1919. *Paramicromus* Nakahara, *Insect Wld.*, **23** : 137.

1922. *Archaeomicromus* Krüger, *Stettin. ent. Ztg.*, **83** : 171.

1922. *Indomicromus* Krüger, *Ibid.* : 171.

1922. *Stenomicromus* Krüger, *Ibid.* : 171.

1922. *Heteromicromus* Krüger, *Ibid.* : 171.

1922. *Neomicromus* Krüger, *Ibid.* : 154.

1922. *Pseudomicrimus* Krüger, *Ibid.* : 172.

1922. *Paramicromus* Krüger (not Nakahara), *Ibid.* : 172.

1922. *Stenomus* Navas, *Broteria* (Zool), **20** : 55.

1922. *Phlebiomus* Navas, *Revta R. Acad. Cienc. exact. fis.-quim. nat. Zaragoza,* **7** : *24.*

1929. *Tanca* Navas, *Ann. Mus. Civ. Stor. nat.,* **53** : 373.

1932. *Menutus* Navas, Boln. Soc. ent. Esp., **15** : 35.

1955. *Idiomicromus* Nakahara, *Kontyu*; **23** : 8.

1960. *Spilomicromus* Nakahara, *Mushi*, 34 : 26.

1960. *Anomicromus* Nakahara, *Ibid.* : 30.

1960. *Afromicromus* Nakahara, *Ibid.* : 34.

1960. *Austromicromus* Nakahara, *Ibid.* : 35.

1993. *Micromus*, Oswald, *J. New York, Entomol. Soc.,* **101**(2) : 253.

Type species : *Hemerobius variegatus* Fabricius.

Diagnostic characters : Forewing : costal area very narrow at extreme base; humeral vein seldom recurrent. Two series of gradate crossveins in both pairs of wings. Hindwing : with 2-4 Rs branches. Abdomen : tergite 9 and ectoprocts fused in both sexes. Male genitalia : gonarcus with arcessus; parameres fused in their proximal parts.

Distribution : Widespread in North and Central America, Europe, Africa, Asia, and Australia. It is also present in many islands of Atlantic, Indian and Pacific Oceans. It is also reported from Hawaiian islands.

Remarks : Only four species from North-East India is dealt with here.

Key to species of the genus ***Micromus***

1. Forewing with M_{3+4} and Cu_1 not fused. 2
- M_{3+4} and Cu_1 fused. 3
2. Arcessus long and straight. ..... *timidus* Hagen
- Arcessus abruptly bent at middle. ..... *kapuri* Nakahara
3. Lengthening of Cup in hindwing to hind margin isolating a series of small cellules; greyish tinge in hind marginal area of forewing very distinct. ..... *linearis* Hagen
- Cup not as above; greyish tinge in hind marginal area not so well marked. .. *calidus* Hagen

14. ***Micromus timidus*** Hagen

1853. *Micromus timidus* Hagen, *Ber. Verh. K. Preuss. Akad. Wiss. Zu.* Berlin : 481.

1867. *Micromus navigatorum* Brauer, *Verh. zool.-bot. Ges. wien.,* **17** : 508.

1885. *Micromus vinaceus* Gerstaecker, *Mitt. naturw. Ver. Neu. Vorpom. u. Rugen.,* **16** : 111.

1894. *Micromus pusillus* Gerstaecker, *Ibid.*, **25** : 171.

1912. *Micromus sauteri* Esben-Petersen, *Ent. Mitt.*, **1** : 198.

1923. *Micromus weryae* Lestage, *Rev. Zool. Afr.*, **11** : 198.

1936. *Archaeomicromus modestus* Navas, *Rev. Zool. Bot. Afr.*, **28** : 350.

1956. *Eumicromus diminutus* Nakahara, *Kontyu*, **24** : 188.

1961. *Micromus timidus* Tjeder, *S. Afr. Anim. Life*, **8** : 313.

1990. *Micromus timidus*, Monserrat, *Proc. Third International Symp. on Neuropterology* : 77.

Diagnostic characters : Head : yellowish. Pro-, and metanotum : yellowish brown. Wings (Pl. 12, figs. 1-2) : oval with obtuse apex. Forewing : yellowish brown tinge over anal portion, a small spot between M & Cu_1; outer gradate row specially black. Abdomen : catoprocessus very long, rather suddenly bent inwards, its tip flattened and with a number of dents. Male genitalia : (Pl. 14, figs. 14-16) : gonarcus with a pair of entoprocessus at apex; arcessus very long and straight; parameres short and stout. Famale : tergite 9 greatly expanded in its ventral portion and produced backwards as processus lateralis; gonapophysis lateralis small; spermatheca in the form of twisted sac; subgenital an elongated plate, dilated towards apex.

Material examined : 3 exs. (♂♀) : 1 ex. India, Tripura, Jalanbari, Inspection Bungalow, 20.ii.1992 (coll. R.S. Barman and party); 1 ex., Mizoram, Aizwal, Zemabawk, 1000 m. 21.i.1995, (coll. T.K. Pal and party); 1 ex., Sikkim, Rongpo, P.W.D. Inspection Bungalow, 20.ix.1996 (coll. S.K. Ghosh).

Distribution : India : (Sikkim; Tripura; Mizoram; South India). Elsewhere : South and Central Africa; Malagasy; the Seychelles; Sri Lanka; Thailand; Malaya; Sumatra; Java; Bali; Taiwan; Iriomote island; Okinawa island; the Philippines; Buru island; New Guinea; Australia; New Caledonia; New Hebrides; Fiji; Samoa islands.

Remarks : The species is for the first time recorded from Sikkim, Tripura and Mizoram States of India.

15. ***Micromus kapuri*** (Nakahara)

1971. *Eumicromus kapuri* Nakahara, Kontyu, **39** : 11.

1988. *Micromus kapuri*, Monserrat, Proc. Third International Symp. on Neuropterology : 228.

1994. *Micromus kapuri*, Makarkin, Raffles Bull. Zoology, **42**(4) : 922.

Diagnostic characters : Forewing : with a short brown streak in basal cubito-medial space; venation : pale; M_{3+4} and Cu_1 completely separated; 8 crossveins to inner and 10 or 11 to outer gradate series. Male genitalia (Pl. 14, figs. 1-2) : ectoproct elongate, produced distally into oblong apex and also with a very long strongly incurved, non-serrated ventral process; arcessus single, broad at base and ending in pointed apex but abruptly bent at middle.

Material examined : Holotype (♂) : India, Meghalaya, Cherrapunji, 2.viii.1914 (coll. S.W. Kemp).

Distribution : India (Meghalaya).

Remarks : The species was described by Nakahara (1971) from Cherrapunji which is now under the state of 'Meghalaya' not 'Assam' as reported in the paper. Makarkin (1994) revised the description of the species on the basis of right wingsand male genitalia mounted on slides. His description varies with regard to number of crossveins in the inner and outer gradate series and number of branches of Rs from the description given by Nakahara (1971).

16. ***Micromus linearis*** Hagen

1858. *Micromus linearis* Hagen, *Verh. zool-bot. Ges.* **8** : 471-488.

1907. *Micromus multipunctatus* Matsumura, *Konchu Bunrui Gaku,* **1** : 171.

1993. *Micromus linearis* Monserrat, *Ann. Mus. Civic. Storia Nat. "G. Doria",* **89** : 499.

Diagnostic characters : Wings : Cu_1 and M_{3+4} fused in both wings; lengthening of Cu_2 in the marginal region of hindwing forming a series of small cells; greyish tinge in hind marginal area of forewing. Male genitalia : ectoproct with rounded apex; catoprocessus fairly straight and sharply pointed; gonarcus with dorsal process; arcessus vartically bifurcated, the upper arm long and claw-like and lower arm very short; parameres long, dilated distally with small ventro-distal hood and also bifurcated at distal end. Female genitalia : ectoproct small; subtriangular; lateral gonapophysis very small; without subgenital plate; spermatheca irregular in shape.

Material examined : 15 exs. (♂ ♀) : India, Meghalaya, Shillong, Botanical Garden, 29.iii.1991; Ward lake, 29.iii.1991 (coll. S.K. Ghosh and party); Mizoram, Champhai, 5.iv.1994 (coll. G.C. Sen and party); Manipur, Charuchandpur, Mouviphai, 2.iv.1992 (coll. D.K.M., S.K.G. and party).

Distribution : India (West Bengal : Darjeeling; Meghalaya; Manipur; Mizoram; Sikkim; Madhya Pradesh; Uttar Pradesh; Jammu & Kashmir). Elsewhere : Sri Lanka, Nepal, the Philippines, Malaysia, Indonesia, Taiwan, China and Japan.

Remarks : Monserrat (1993) designated one lectotype and other paralectotypes from four syntypes. The species is for the first time recorded from Mizoram and Manipur.

17. ***Micromus calidus*** Hagen

1859. *Micromus calidus* Hagen, *Verh. zool. Bot. Ges.*, **9** : 199-212.

1908. *Micromus sabulosus* Navas, *Mem. R. Acad. Cienc. Artes Barcelona,* **6** : 406.

1910. *Micromus nilghiricus* Navas, *Broteria* (Ser. zool.) **9** : 74.

1915. *Eumicromus maculatipes* Nakahara, *Annot. Zool. Jap.*, **9** : 39.

1920. *Micromus pictipes* Banks, *Bull. Mus. Comp. Zool. Harv.*, **64** : 334.

1993. *Micromus calidus*, Monserrat, *Ann. Mus. Civ. Storia Nat.*, **89** : 484.

Type designation : Hagen (1859) did not designate the type. Type series of this species comprises one male and three females syntypes. Monserrat (1993) designated male specimen as lectotype and other female specimens as paralectotypes.

Diagnostic characters : Clypeus : with two brown spots on either side. Gena : with two shiny triangular brown spots. Legs : brown with dark spots. Forewing : brown; pterostigma indistinct; brown stripes in costa; subcosta and radius longer than other longitudinal veins; brown stripe between posterior media, and anterior cubitus; both series of gradates with black suffusion excepting for the penultimate basal crossvein of both series. Hindwing : with pale brown venation; pterostigma dark brown. Abdomen : 9th tergite subdivided into two subtriangular pieces with an antecosta extending into a triangular process; ectoproct ovoid; catoprocessus sub-cylindrical with its sclerotised apex bearing small denticules. Male genitalia (Pl. 14, figs. 12-13) : gonarcus narrow; mediuncus rhomboidal in caudal view and bearing irregularly distributed denticules; arcessus subtriangular, broader basally and subcylindrical apically with sensory denticules; parameres fused anteriorly; hypandrium triangular. Female : Abdomen : ectoproct ovoid; lateral gonapophysis eliptical and small; subgenital plate spatulated with a middle longitudinal incision and associated with a squarish internal structure in ventral view; spermatheca sclerotised and very hairy at its distal end.

Material examined : 1 ex. : India, West Bengal, Darjeeling dt., Kalimpong, v.1915 (coll. F.H. Gravely); 1 ex., Mizoram, Teirei, 11.x.1995 (coll. M.S. Shishodia).

Distribution : India : (Meghalaya : Khasis; Mizoram; West Bengal, Darjeeling; Tamil Nadu : Nilgiri and Kodaikanal; Himachal Pradesh : Simla; Uttar Pradesh : Nainital). Elsewhere : Nepal, Sri Lanka, Malaysia, the Philippines, Japan.

Remarks : The species shows a high degree of variability in colouration of wings, number and distribution of spots (Monserrat, 1993). However the species is for the first time recorded from Mizoram.

Genus 11. ***Neuronema*** MacLachlan

1869. *Neuronema* MacLachlan, *Ent. Mon. Mag.*, **6** : 27.

1912. *Ninguta* Navas, *Rev. Russ. Ent.*, **12** : 420.

1913. *Ninga* Navas, *Boln. Soc. aragon. Cienc. Artes Barcelona*, **3(12)** : 122.

1936. *Kulinga* Navas, *Notes Ent. chin.*, **3** : 49.

1946. *Sineuronema* Yang, *Acta Zootax. Syn.*, **1** : 276, 280.

1993. *Neuronema* Oswald, *J. New York Entomol. Soc.*, **101**(2) : 242.

Type species : *Hemerobius decisus* Walker

Diagnostic features : Forewing : not falcate; with two subcostal crossveins; generally with 4-6 radial sectors; inner gradate series very much well developed. Male genitalia : ectoproct with apical process or with serrated border; gonarcus expanded laterally; aedeagus single; parameres fused basally.

Distribution : India : Nepal; China; Taiwan; USSR; Japan.

Remarks : Three species were reported from India which are dealt with here.

Key to species of the Genus ***Neuronema***

1. Male with ectoproct roundish in outline and with a series of small protruberances at apex; female with subgenital plate rounded and entire. ..... *nepalensis* Nakahara

- Male with ectoproct not rounded in outline but quadrate or triangular; female with subgenital plate more or less elongate. 2

2. Male with ectoproct quadrate and distal angle extending to an acute and downwardly directed apex; lower margin with a small tooth; female with subgenital plate elongate but constricted at basal half. ..... *assamensis* Kimmins

- Male with ectoproct triangular and terminating in a slender spine; lower margin with a triangular projection; female with subgenital plate elongate but shorter than above and not so constricted at basal half. ..... *decisum* (Walker)

18. *Neuronema nepalensis* Nakahara

1971. *Neuronema nepalensis* Nakahara, *Kontyu,* **39**(1) : 13.

1990. *Neuronema nepalensis*, Monserrat, *Proc. Third International Symp. on Neuropterology* : 232.

Diagnostic features : Head : fuscous brown. Thorax : dark fuscous. Forewing (Pl. 13, fig. 1) : membrane tinged with brownish grey and with irregular fuscous brown maculations and also with alternate dark and pale areas along entire margin; R_1, Cu, outer and discal gradates with fuscous brown. Hindwing (Pl. 13, fig. 2) : membrane tinged with brownish grey; Cu_1 very strongly coloured and outer gradates almost blackish towards apex. Male genitalia (Pl. 14, figs. 3-5) : ectoproct almost round with a series of small protruberances on dorso-posterior border; 9th sternite relatively short; gonarcus with a pair of very prominent processes strongly bifurcate at apex; arcessus broad at base, suddenly narrowed into a long process, end of which slightly dilated and shallowly concave with a small claw-like projection; parameres fused, distally forming bipartite apex. Female genitalia : subgenital rounded and entire but without concavity at middle.

Material examined : 13 exs. (♂♀) : India, Sikkim, Zeema, 23.vii.1989 (coll. S.S. Saha and party); Lachen, 4.iv.1989 (coll. S. Chatterjee and party); 5 kms. north-west of Lachen, 29-30.vii and 1.viii.1989 (coll. S.S. Saha and party).

Distribution : India (Sikkim). Elsewhere : Nepal.

Remarks : Nakahara (1971) described the species from Nepal. This species is for the first time recorded from India including Sikkim. Makarkin (1994) emphatically stated that the species belongs to the genus *Sineuronema* Yang. The detailed description of the species awaits publication. So it is not possible at present to change the generic identity of the species. It is also not understood the reason for changing the name of the species "nepalensis" as coined by Nakahara (1971) to "nepalense" as indicated by Makarkin (1994).

*19. *Neuronema assamensis* Kimmins

1943. *Neuronema assamensis* Kimmins, *Ann. Mag. nat. Hist.*, (11)**10** : 44.

1990. *Neuronema assamensis*, Monserrat, *Proc. Third International symp. on Neuropterology* : 231.

Diagnostic characters : Head and Thorax : dark fulvous. Forewing : greyish hyaline with brownish streaks and irrorations near base of wing, on two outer gradate series; spots along radius and pale spots around margins; Rs with 5 branches; deltoid mark represented by an oblique whitish band across branches of cubitus. Hindwing : greyish hyaline with 9 branches to Rs. Male genitalia (Pl. 14, figs. 10-11) : ectoproct quadrate with its distal angle extended to an acute apex and lower margin with a small tooth; gonarcus large with curved side lobes and a pair of curved lobes arising from its dorsal surface; parameres short with lateral lobes; arcessus long and pointed at apex. Female genitalia : subgenital elongated, constricted in basal half and with concavity at apex.

Distribution : India (Meghalaya : Khasi Hills).

Remarks : Kimmins (1943) described the species from Khasi Hills which presently falls under the jurisdiction of Meghalaya but not "Assam" as reported by Kimmins (loc. cit.). However, the material is not available for study. From the literature review it appears that the characters are quite distinctive to differentiate this species from its nearest allies.

*20. ***Neuronema decisum*** (Walker)

1860. *Hemerobius decisus* Walker, *Trans. Ent. Soc. Lond.*, (N.S.) **5** : 185.

1969. *Neuronema decisum* MacLachlan, *Ent. Mon. Mag.*, **6** : 27.

1993. *Neuronema decisum*, Oswald, *J. New York entomol. Soc.*, **101**(2) : 243, figs. 166-173.

Diagnostic characters : Head : with a black mark on vertex and with a black point on each side. Thorax : blackish. Forewing : thickly varied with blackish-cinereous; borders with pale dots; two oblique blackish streaks in disc; veins black; indistinct deltoid spot on hind margin. Male genitalia (Pl. 14, figs. 8-9) : ectoproct produced in a long triangle and terminate in a slender spine; small triangular projection towards base of lower margin; gonarcus hoodshaped with small side lobes; parameres short, curved, fused and with lateral lobes; arcessus long, bent at middle and ending in a backwardly directed acute apex. Female genitalia : subgenital plate rounded at apex with a small u-shaped excision.

Distribution : India (West Bengal : Darjeeling; Punjab : Subathu).

Remarks : As the material is not available for study the species has been reviewed from the literature.

Genus 12. ***Neomicromus*** Ghosh

1990. *Neomicromus* Ghosh, (not Krüger), *Rec. zool. Surv. India*, **87**(1) : 61.

Type species : *Neomicromus agarwalai* Ghosh

Diagnostic characters : Forewing : with elliptical apex; humeral vein unforked and not recurrent; M_{3+4} and Cu separated; outer and inner gradate series of crossveins not regularly arranged; Rs

with 4 branches. Hindwing : Rs with 3 branches. Male genitalia : ectoproct with short spiny catoprocessus; parameres proximally separated but distally united and with a pair of large processes; gonarcus arch-shaped, without arcessus but with a process at middle which bends on either side to form a hook. Female genitalia : tergite 9 greatly expanded below ectoproct.

Distribution : India (Tripura).

Remarks : Ghosh (1990e) described Gen. et. sp. nov. from Tripura and the paper has been published.

21. ***Neomicromus agarwalai*** Ghosh

1990. ***Neomicromus agarwalai*** Ghosh, Rec. zool. Surv. India, **87**(1) : 61-62.

Diagnostic characters : Pronotum : broader than long with dark shading towards margins. Forewing : narrow with elliptical apex; pterostigma inconspicuous; membrane tawny; longitudinal veins pale yellow interrupted by brown streaks, with distinct brownish spots at apex of Cu_2, 1A & 2A, between M & Cu and on a single apical gradate in inner row; outer gradates clouded with brown. Hindwing : longitudinal veins pale at base but brown apically; inner gradates pale, outer gradates brown. Male and female abdominal tip and male genitalia : as in Pl. 15, figs. 1-5.

Material examined : 2 exs., (♂ ♀ : Holotype & Allotype) : India, Tripura, Agartala, date nil (coll. B.K. Agarwala).

Distribution : India (Tripura).

Family D. DILARIDAE

Diagnostic characters : Antenna (Pl. 11, fig. 2) : coarsely pectinate in males. Vertex : with three prominent ocellus-like tubercles. Wings : similar in form and venation. Forewing (Pl. 11, fig. 1) : 2 or more branches of Rs arising from apparently fused stem of R_1 and Rs; crossveins numerous. Abdomen : Male : midposterior portion of 9th tergite well chitinised and pigmented, forming a low triangular area; 10th tergite split into two large lateral plates; anal plates beset with long hairs and enclose between them 10th sternite and two pairs of strongly chitinised structures with long, claw-like prolongations (external claspers - Nakahara, 1955). 10th sternite consisting of dorsal and ventral lobes; distal end of dorsal lobe produced into a short projection of varying shape (aedeagus, Nakahara 1955) and distal end of ventral lobe produced into a pair of arms, each with distinct tooth usually at apex (internal claspers - Nakahara, 1955); median process arising from mid posterior region of ventral lobe and lying in between aedeagus and internal claspers. Hypandrium, a triangular structure below 10th sternite. Female : ovipositor long and exserted.

Genus 13. ***Dilar*** Rambur

1842. *Dilar* Rambur, *Hist. nat. Ins. Neur.*, p. 445.

1909. *Lider*, Navas, *Mem. R. Acad. Cien. Art. Barcel.*, **7** : 650.

1909. *Rexavius* Navas, *Ibid.* : 664.

1962. *Dilar*, Kuwayama, *Pacific insects*, **4** (no. 2) : 375.

Type species : *Dilar nevadensis* Rambur

Diagnostic characters : Mouth : hardly prominent. Palpi : extremely short. Ocelli : 3, far apart, hind pair very large, opaque. Antenna : long and pectinate in males, teeth long and far apart; denticulate in females. Prothorax : short. Legs : tarsi 5-segmented, first joint much longer than others; claws with pulvillus (empodium; cushion) between them. Wings : veins rather numerous but with very few cross veins except in costal space. Genitalia : female with long ovipositor.

Distribution : Afghanistan, Iberian Peninsula, India, Japan, Pakistan, Taiwan.

Remarks : Only a couple of species of the genus is known from India of which one is dealt with here.

22. ***Dilar hornei*** MacLachlan

1859. *Dilar hornei* MacLachlan, *Ent. Mon. Mag.*, **5** : 240.
1977. *Dilar hornei*, Ghosh & Sen, *Rec. zool. Surv. India*, **73** : 281.

Diagnostic characters : Head : with a large rounded tubercle on each side of middle; a broad transverse sulcus before clypeus. Mandibles : yellow with acute piceous point. Antenna (Pl. 11, fig. 2) : grey, third segment with short teeth; each segment from 4th to 21st with a flexible process two times longer than each segment. Forewing (Pl. 11, fig. 1) : with numerous short transversely elongate spots which are more or less confluent; a large and dark spot with a horny black dot at centre in the disc, similar smaller spot at base and larger spots at apical margin; neuration yellowish. Hindwing : darker spots almost obsolete; pterostigmal region yellowish grey. Legs : pale lemon-yellow. Abdomen : fuscus, densely clothed with long yellowish hairs.

Material examined : 1 ex. : India, Kurseong, E. Himalayas, 4,700 ft., 14-17.iv.1911 (coll. N. Annandale).

Distribution : India (West Bengal : Darjeeling; N.W. India).

Remarks : Ghosh (in press) recorded this species from West Bengal.

Family E. OSMYLIDAE

Diagnostic characters : Medium sized insects with length of forewing 15-30 mm. Head : short, rounded and with large, prominent compound eyes. Ocelli : three. Antenna : setose; multisegmented; short; less than half the length of forewing. Mandible : well developed; acutely pointed; somewhat asymetrical. Pronotum : generally a little longer than wide. Meso- and metanotum : large, wider than pronotum; each with a well developed scutellum. Wings (Pl. 22, figs. 1-2) : subequal; oval or falcate at apex; trichosors present on margins except towards base of costal and inner magins; coupling apparatus not evident; costal space broad specially in forewing; costal veinlets with numerous branches or unbranched; pterostigma distinct; Sc and R closely

parallel and coalescing below pterostigma; Rs originating from base of wing and with several branches; M branching near wing base and parallely running in close proximity until their apical forking; Cu also forking near base of wing; anal veins generally much branched; discal area generally with numerous crossveins leaving a broad marginal space free of cross veins. Abdomen : more or less weak with well developed tergites and sternites and large pleural regions between them. Male genitalia : dorsally fused ectoprocts forming a hood-like structure, each with a large cercal callus with numerous trichobothria; an arch-formed gonarcus situated below ectoproct; gonarcus generally with a pair of entoprocessus; parameres either free or fused to one another; hypandrium internum present. Female genitalia : 9th tergite prolonged downwards; subgenitale present below 8th tergite; gonapophysis lateralis long and each carrying a small stylus; ectoprocts with large cercal callus and numerous trichobothria; two spermathecae present.

Remarks : Three subfamilies of this family are dealt with.

Key to subfamilies of the family OSMYLIDAE

1. In hindwing Cu_2 long. ..... *Osmylinae*
- In hindwing Cu_2 short. 2
2. M without basal spur in hindwing. ..... *Protosmylinae*
- M with basal spur in hindwing. ..... *Spilosmylinae*

Subfamily a. OSMYLINAE

Key to genera of the subfamily OSMYLINAE

1. In forewing, costal crossveins united by transverse veins to form several irregular rows of small cellules. ..... *Hyposmylus* MacLachlan
- In forewing, costal crossveins not united by transverse veins. 2
2. Costal crossveins simple; gradate crossveins regularly arranged and well-differentiated in forewing. ..... *Mesosmylus* Krüger
- Costal crossveins forked; gradate crossveins not regularly arranged and hardly differentiated. ..... *Parosmylus* Needham

Genus 14. ***Hyposmylus*** MacLachlan

1870. *Hyposmylus* MacLachlan, *Entomologists mon. Mag.*, **6** : 200.

Type species : *Osmylus punctipennis* Walker

Diagnostic characters : Vertex : much inflated but showing declevity above antenna. Ocelli : in downward slope of vertex above antenna. Maxillary palpi : two basal segments short but others longer and equal. Prothorax : longer than broad. Wings : broad. Forewing : costal veinlets forked, united by transverse veins to form irregular rows of small cellules; Sc with a basal crossvein; Sc and R_1 united at apex; Rs with parallel branches; discal cells numerous; marginal veinlets forked.

Distribution : India.

Remarks : Only a single species has hitherto been reported from India including the North-Eastern region which is dealt with.

23. ***Hyposmylus punctipennis*** (Walker)

1859. *Osmylus punctipennis* Walker, *Trans. R. ent. Soc. Lond.*, (N.S.) **5** : 183.

1870. *Hyposmylus punctipennis* MacLachlan, *Entomologists mon. Mag.*, **6** : 200.

1910. *Dictyosmylus lunatus* Navas, *Ann. Soc. Sci.*, **34** : 189.

Redescription : Head : brownish yellow particularly on vertex; with two large tubercles in posterior portion below eyes; ocelli small in ocellar triangle, dull coloured and with long white setae. Antenna : brown. Clypeus and labrum : brown. Mouth parts : yellow. Pronotum : dark brown with long yellowish hairs. Meso- and metanotum : dark brown. Legs : brownish yellow with yellow hairs but tarsi dark brown. Wings (Pl. E, fig. 1) : long with acute tip and outer margin distinctly convex; membrane greyish; pterostigma yellowish. Forewing : long with acute tip and outer margin distinctly convex; membrane greyish; pterostigma yellowish. Forewing : longitudinal veins pale yellow; majority of crossveins dark brown; a short blackish streak and a rounded black spot on inner gradate series; outer gradate series with three rounded black spots; two black spots between Cu and anal margin; an embossed spot lying middle between first and second branch of Rs; several costal crossveins connected with short veinlets making a network feature; 2 crossveins between Rs and M before basal eye spot. Hindwing : shorter and narrower than forewing; without any spot; venation concolorous to forewing. Abdomen : dark brownish above with testaceous hairs.

Material examined : 5 exs. (♂♀) : India, Meghalaya, Khasi Hills, Maflong, 5900 ft., 6.iv.1915 (coll. S.W. Kemp); Shillong, 30.ix.1965 (coll. S. Biswas); Sikkim, Singhik, 13.v.1962 (coll. S. Ali), Sugarloaf Exped., Tsungthan, 14.x.1979 (coll. H.C. Ghosh), South dist., 3.x.1988 (coll. V.C. Agarwal).

Distribution : India (Sikkim, Meghalaya, "Indian Septentrionale", "Kunawur" and Uttar Pradesh).

Remarks : Ghosh (paper in press) recorded this species from Meghalaya. Presently, this species is for the first time recorded from Sikkim. Banks (1940) while reporting *Osmylus punctipennis* Walker from China stated, "This agrees well with a specimen from North-East India taken by Thorey in 1865 but is little longer (forewing 28 mm. long), but venation and the small dark dots are the same. It was described from North India; *Dictyosmylus lunatus* Navas, from the Himalayas is the same". The author is corroborating the views of Banks.

Genus 15. ***Mesosmylus*** Krüger

1913. *Mesosmylus* Krüger, *Stettin ent. ztg.*, **74** : 280.

Type species : *Osmylus naevius* Navas

Diagnostic characters : Forewing : costal crossveins simple; stem of Rs short; with a single

radio-medial crossvein before stem of Rs; Cu_1 and Cu_2 with large number of crossveins; gradate crossveins in rows and well differentiated. hindwing : Cu_2 long; media without any basal spur.

Distribution : India.

Remarks : Only a single species has hitherto been reported from India particularly from North which is dealt with.

*24. ***Mesosmylus naevius*** (Navas)

1912. Osmylus naevius Navas, Mem. R. Acad. Sci, Barcelona, (Ser. 3) **10**(9) : 52.

1913. Osmylus naevius, Krüger, Osmylidae III a, Stettin. ent. ztg., 74 : 275.

1913. Mesosmylus naevius Krüger, Osmylidae, IV Ibid., p. 289-291.

Diagnostic characters : Head : brown. Frons : yellowish. Prothorax : transverse, brown. Meso- and metathorax : dorsally brown. Wings : long, pointed with two rows of gradate veins. Forewing : with dark brown markings all over; markings small in costal field, otherwise large except betweem M and Cu and also between Cu_1 and Cu_2; two streaks from hind border extending towards apex but not continuing into it. Legs : yellow; tibiae with brown spots. Abdomen : brown with yellowish markings.

Distribution : India (Sikkim, Assam).

Remarks : Due to the paucity of the material, the species has been reviewed from literature. Krüger (1913) showed the distribution of the species as "nordindien : Sikkim, Assam." It is not clear whether the species was recorded from both the states or it has been reported either from Sikkim or Assam.

Genus 16. ***Parosmylus*** Needham

1909. *Parosmylus* Needham, *Rec. Indian Mus.*, **3** : 209.

1977. *Parosmylus*, Ghosh & Sen, *Rec. zool. surv. India*, **73** : 285.

Type species : *Parosmylus prominens* Needham

Diagnostic characters : Labrum : emarginate. Mandibles : broad and coarsely toothed. Wings : broad, moderately hairy; costal area narrow at base, widened beyond and traversed by numerous partly branched crossveins; Sc and R fused at tip; a single basal subcostal crossvein; Rs arising near Sc crossvein; gradate crossveins hardly differentiated; disc with numerous. irregularly arranged crossveins; branches of M and Cu running parallely and suddenly terminating in marginal forks; Cu_2 with a long series of forks to hind margin. Legs : fore-coxae with a cylindrical corneous internal process specially in males; tarsal claws basally serrate.

Distribution : India (Uttar Pradesh; Himachal Pradesh and Sikkim).

Remarks : The genus is for the first time recorded from North-East India.

25. ***Parosmylus belaae*** Ghosh & Sen

1968. *Parosmylus belaae* Ghosh & Sen, *Zool. Anz.*, *Bd.* **180**, Heft 1/2, pp. 107-109.

1977. *Parosmylus belaae* Ghosh & Sen, *Rec. zool. Surv. India*, **73** : 285.

Description : Female : Head : dark brown. Vertex : convex. Ocelli : yellowish. Antenna : (broken) remaining basal two segments dark brown. Thorax : blackish. Wings : long with obtuse tip and straight costal margin. Forewing (Pl. 22, fig. 3) : smoky with purple reflection and also with brownish patches and clouds; brownish patches darker towards costal margin; veins dark brown; costa with numerous crossveins which are mostly forked; pterostigmal region and beyond with distinct brown patches; R_1 with quite a large number of brown lines, each lying above each crossvein between R_1 and Rs; discal cells quadrate or hexagonal; small brown patches between Cu_1 and Cu_2; brownish clouds at apex, posterior margin and several gradate veinlets. Hindwing : hyaline; without any brown patch but with brownish margins. Legs : pale yellowish; femora and tibia almost equal in length; forecoxae without corneous process as in male. 1st tarsal segment of hind pair almost equal to following four tarsal segments taken together and terminal segment with a pair of claws. Abdomen : apex as in Pl. 22, fig. 4.

Material examined : 1 ex. (♀): India, Sikkim, Lachung 6.v.1994 (coll. S. Chakraborty and party) 1 ex. (♂): Arunachal Pradesh, Western Kameng, Zamiri, 14.x.1996, (Coll. S.K. Mandal).

Distribution : India (Uttar Pradesh : Garhwal; Sikkim).

Remarks : Ghosh and Sen (1968) described, *P. belaae* from a single male specimen collected from Uttar Pradesh, Garhwal, Western Himlayas. In course of study of the material collected from North-East India, Ghosh encountered the female specimen of *P. belaae* in partially damaged condition and a male from Arunachal Pradesh. The description of female of this rare species alongwith the diagram of tip of female abdomen is included in this paper. This is for the first time, the female is recorded from India including Sikkim and the species is a first record from Arunachal Pradesh. The distribution of the species is thus extended from Western Himalaya to Eastern sector.

Subfamily b. PROTOSMYLINAE

Key to genera of the subfamily PROTOSMYLINAE

Stem of Rs long. ..... *Heterosmylus* Krüger

Stem of Rs short. ..... *Gryposmylus* Krüger

Genus 17. **Heterosmylus** Krüger

1913. *Heterosmylus* Krüger, *Stettin. ent. ztg.*, **74** : 37.

1977. *Heterosmylus*, Ghosh & Sen, *Rec. zool. Surv. India*, **72** : 284.

Type species : *Heterosmylus aspersus* Krüger

Diagnostic characters : Forewing : costal crossvein simple; stem of Rs long and without

crossvein between it and M; with single radio-medial crossvein at base; few crossveins between branches of Rs; 3 crossveins between Cu_1 and Cu_2; with 3 rows of gradate crossveins. Hindwing : media without basal spur; Cu_2 very short.

Distribution : India (Sikkim). Elsewhere : Taiwan.

Remarks : Only a single species of the genus has so far been reported from India which is dealt with here.

*26. ***Heterosmylus aspersus*** Krüger

1913. *Heterosmylus aspersus* Krüger, *Stettin. ent. ztg.*, **74** : 37.

1955. *Heterosmylus aspersus*, Nakahara, *Kontyu*, **23** : 10.

1977. *Heterosmylus aspersus*, Ghosh & Sen, *Rec. zool. Surv. India*, **72** : 284.

Diagnostic characters : Head : small. Face, frons and vertex : without spot. Ocellar region dark. Antenna : yellowish including two basal segments. Ocelli : 3 in equilateral triangle. Prothorax : small and without any stripe. Meso- and metathorax : dark-brown. Wings : small; apex obtuse; longitudinal veins alternately dark and clear but not dotted; Sc completely clear. Forewing : almost each crossvein between Radius and base of Cu with small or large rectangular brown portion; crossveins between R and Rs with T-shaped and also crossveins between first branch of Rs and M_1 with lance-shaped brown marks. Hindwing : markings greatly reduced excepting for pterostigma and distinct lines on Radius. Legs : yellowish. Abdomen : yellowish.

Distribution : India (Sikkim).

Remarks : As the material is not available for study, the species is reviewed from the literature. Nakahara (1955) states, "The genus *Heterosmylus* Krüger is based on undescribed species, *H. spersus* Krüger, nom. nud., from North India. "Thus he claimed that his species *H. primus* as the first species of the genus *Heterosmylus*. In this connection, it may be stated that either the literature was inaccessible to Dr. Nakahara or he has not gone through it. Because Krüger (1913) in page nos. 237-240 described the species on which the genus description is based. Moreover, he has spelt the species as "*spersus*" not "*aspersus*" as recorded by Krüger. So, *H. aspersus* Krüger is the first species and *H. primus* Nakahara may be considered as the second species described from Taiwan.

Genus 18. ***Gryposmylus*** Krüger

1913. *Gryposmylus* Krüger, *Stettin. ent. ztg.*, **74** : 19.

Type species : *Osmylus pubicosta* Walker

Diagnostic characters : Forewing : costal crossveins simple; stem of Rs short and with a single crossvein between R and M at base; with 3-rows of gradate crossveins. Hindwing : media without basal spur; Cu_2 short.

Distribution : India.

Remarks : Only a single species has so far been reported from India which is dealt with here.

*27. ***Gryposmylus pubicosta*** (Walker)

1859. *Chrysopa pubicosta* Walker, *Trans. ent. Soc. Lond.*, (N.S.) **5** : 183.

1870. *Osmylus pubicosta*, MacLachlan, *Entomologists. mon. Mag.*, **6** : 198.

1913. *Gryposmylus pubicosta*, Krüger, *Stettin. ent. ztg.*, **74** : 226.

Diagnostic characters : Vertex : much inflated with irregular blackish markings. Frons : with blackish dots. Antenna : yellowish with two basal segments black. Prothorax : with interrupted longitudinal black lines. Wings : broad; subacute at apex; veins and crossveins whitish. Forewings : costal area very broad at base, rather abruptly dilated with few blackish markings; pterostigma yellowish with a spot on either side of it; a short transverse streak on inner series of gradate crossveins; scattered dots at base and anterior margin; veins and crossveins with black point; majority of crossveins in inner gradate series, some in outer and several at base of costal area black. Hindwing : with a black spot on wither side of pterostigma; some of the gradate crossveins in both series blackish.

Distribution : India (upper Assam; U.P., Masuri).

Remarks : Due to the paucity of the material, the species has been reviewed from literature.

Subfamily c. SPILOSMYLINAE

Key to genera of the subfamily SPILOSMYLINAE

Wings without hyaline fenestrate patches and with or without embossed spot on posterior margin of forewing; in hindwing, base of M_{3+4} spurred. ..... *Spilosmylus* Kolbe

- Wings with hyaline fenestrate patches and without embossed spot on posterior margin of forewing; in hindwing, base of M_{3+4} not spurred. ..... *Thyridosmylus* Krüger

Genus 19. ***Spilosmylus*** Kolbe

1897. *Spliosmylus* Kolbe, *Dietrich Reimer*, **3** : 32.

1913. *Rhipidosmylus* Krüger, *Stettin, ent. ztg.*, **74** : 61.

1914. *Conchylosmylus* Krüger, *Ibid.*, **75** : 20.

1914. *Ostriosmylus* Krüger, *Ibid.*, : 30.

1914. *Kalidosmylus* Krüger, *Ibid.*, : 29.

1914. *Grammosmylus* Krüger, *Ibid.*, : 34.

1915. *Heliosmylus* Krüger, *Ibid.*, **75** : 80.

1917. *Centrolysmus* Navas, *Mus. Barcel. Sci. Nat. Opera*, (Zool.), **11** : 15.

1957. *Spliosmylus*, Tjeder, *South African Animal Life*, **4** : 173.

1977. *Spliosmylus*, Ghosh, *Rec. zool. Surv. India,* **73** : 285.

Type species : *Spilosmylus africanus* Kolbe

Diagnostic characters : Head : with rather indistinct ocelli; clear lens scarcely visible. Forewing : a space free of cross vein present after 1st crossvein from M connecting with Cu_1; without hyaline fenestrate patches; frequently with an embossed spot on posterior margin. Hindwing : base of M_{3+4} spurred (having a short additional veinlet, directed against the wing base). Leg : tibia with two spurs, one of these being very short; claws serrate. Abdomen : Male : 9th tergite without dorsal processes; gonarcus well developed with slender entoprocessus; baculum lacking; subarcus present; parameres fused distally. Female : 8th tergite moderately prolonged laterally, not reaching undersurface of abdomen; 9th tergite band-like, not extending below ventral surface; subgenitale short with upwordly extended lateral prongs; postgenitale absent; gonapophysis lateralis moderate; stylus very small; each spermatheca with a long tubular glandula accessoria.

Distribution : Africa, Australia, China, India, Indonesia, Japan, New Guinea, The Philippines, Sri Lanka and Taiwan.

Remarks : Only three species of the genus are being reported from N.E. India including the new species.

Key to species of the genus ***Spilosmylus***

1. A brown horny tubercle with yellow stripes on hind margin towards base of forewing present. ..... *tuberculatus* (Walker)

- Brown horny tubercle in forewing absent. 2

2. Prothorax yellow with a narrow brown stripe on either side. ..... *darjeelingensis* sp. nov.

- Prothorax without stripe but with black spots. ..... *conspersus* (Walker)

28. ***Spilosmylus tuberculatus*** (Walker)

1853. *Osmylus tuberculatus* Walker, *Cat. Brit. Mus. Neur.*, **2** : 255.

1893. *Osmylus modestus* Gerstaecker, *Mitt. natur. Ver. Neu. Vorpom. u. Rugen,* **25** : 77.

1914. *Osmylus (lysmus) japonicus* Okamoto, *Ent. Mitt.*, **3** : 23.

1914. *Spilosmylus conformis* Navas, *Mem. Acad. Cienc. Art. Barcel.*, (3)**10** (9) : 53.

1914. *Spliosmylus tuberculatus* Nakahara, *Annot. Zool. Jap.*, **8** : 502.

1925. *Spliosmylus modestus* Krüger, *Stettin. ent. ztg.*, **76** : 78.

1937. *Spliosmylus japonicus* Banks, *Philip. J. Sci.*, **62** : 278.

1980. *Spliosmylus tuberculatus* Ghosh, *Rec. zool. Surv. India,* **77** : 248.

Diagnostic characters : Antenna : yellow. Wings (Pl. 22, figs. 1-2) : hyaline. Forewing : veins whitish, interrupted by brown bands; pterostigma yellowish; a small dot present in the crossvein

between first branch of Rs and M and one of the cells between second and third branches of Rs; three crossveins in outer gradate series and two in inner gradates distinctly clouded with brown; a brown tubercle with yellow stripes on hind border at one third of length from base. Hindwing : without tubercle and dots.

Material examined : 1 ex. (damaged) : India, upper Assam, 26.i.1909 (coll. W. Doherty).

Distribution : India (Assam, Maharastra and Andaman Is.).

29. ***Spilosmylus darjeelingensis*** sp. nov.

Description : Head : yellow with black markings near ocellar region. Clypeus and frons : dark brown. Labium : pale brown. Antenna : yellow but basal segments darker. Pronotum : yellow with a narrow brown stripe on either side. Mesonotum : yellowish. Metanotum : dark brown. Wings (Pl. E, fig. 2) : hyaline; longitudinal veins pale with dark brown markings; crossveins dark brown; pterostigma indistinct with a brown spot on either side. Forewing (Pl. 25, fig. 1) : Sc and R_1 pale with brownish markings; brown patches in the space between Sc and R_1; radial crossveins either wholly or partially clouded with brown; brownish clouds in inner and outer gradate series and also on Cu beyond middle; outer and posterior margin faintly brownish; without horny tubercle. Hindwing (Pl. 25, fig. 2) : several crossveins brown but some whitish; no prominent brownish clouds as in forewing; posterior margin slightly enfumed with brown. Legs : pale yellow. Abdomen (Pl. 25, fig. 3 & 6) : black. Female gentalia; ectoprocts : short; gonapophysis lateralis narrow at base but gradually broadened towards apex; styli at apex. Male genitalia (Pl. 25, figs. 4-5) : ectoproct with thumb-like projection on lower portion; genitalia as in figs.

Measurement : 1 female (Holotype) : Length of forewing : 21 mm. Hindwing : 19 mm.

Material examined : 1 ex. (Holotype ♀) : India : West Bengal, Darjeeling, Rangiroom F.R. House, alt. 6275 ft., 9.vi.1975; 1 ex., (Allotype ♂) 29.iv.1974 (coll. J.K. Jonathan and Party).

Distribution : India (West Bengal).

Remarks : The species can be easily distinguished from *Spilosmylus tuberculatus* (Walker) by the absence of horny tubercle on hind border at one third of length from base of forewing. It may be mentioned here that the markings in the wings are less prominent in male.

30. ***Spilosmylus conspersus*** (Walker)

1853. Osmylus conspersus Walker, Cat. Brit. Mus. Neur., **2** : 234.

Diagnostic characters : Testaceous. Head : with some brown spots on vertex. Antenna : pale testaceous, pubescent. Pronotum : linear with six black spots; not longer than broad. Meso- and metanotum : pitchy with a yellow spot on each disc. Legs : pale testaceous. Wings : almost limpid; some yellowish marks on the borders towards tips; veins alternately brown and whitish; transverse veins clouded with brown of which there are a few spots in the disc and along fore border; areolets of disc mostly quadrilateral in forewings. Abdomen : pitchy.

Material examined : 1 ex. India : West Bengal, Darjeeling, Kalimpong, 600-4500 ft., 24.ii.-10.v.1915 (coll. F.H. Gravely).

Distribution : India (West Bengal). Elsewhere : East Indies.

Genus 20. ***Thyridosmylus*** Krüger

1913. *Thyridosmylus* Krüger, *Stettin. ent. ztg.*, **74** : 87.

1977. *Thyridosmylus* Ghosh & Sen, *Rec. zool. Surv. India*, **27** : 286.

Type species : *Osmylus langii* MacLachlan

Diagnostic characters : Wings : after the first cross vein leading from M to Cu in the forewing, a clear space free from cross veins present in this area; second cross vein leading from Rs to M arising from stem of Rs; M forked before origin of first branch of Rs; wings with hyaline fenestrate patches and without an embossed spot on posterior margin of forewing.

Distribution : India.

Remarks : Only three species have so far been reported from N.E. India which are dealt herewith.

Key to species of the genus ***Thyridosmylus***

1. Forewing spotted areas forming small rounded pastules. ..... *pastulatus* Kimmins
- Forewing spotted area without pastules. 2
2. A broad band near apex of forewing emitting three broad streaks; large spot in cubito-anal area. ..... *langii* (MacLachlan)
- Without broad band at apex or large spot on cubito-anal area. .. *perspicillaris* (Gerstaecker)

*31. ***Thyridosmylus pastulatus*** Kimmins

1942. *Thyridosmylus pastulatus* Kimmins, *Ann. Mag. nat. Hist.*, (11)**9** : 849.

1977. *Thyridosmylus pastulatus*, Ghosh & Sen, *Rec. zool. Surv. India*, **73** : 286.

Diagnostic characters : Wings : falcate. Forewing : sprinkled with numerous round fuscous spots and membrabe in spotted areas either elevated or embossed to form small rounded pustules. Hindwing : venation shaded more heavily.

Distribution : India (Meghalaya : Khasi Hills; Himachal Pradesh : Simla).

Remarks : Though the species is quite close to *T. langii* (MacLachlan) but Kimmins (1942) reported that the falcate wings with their embossed spots afford ample characters for separation of species pastulatus from *langii*.

32. ***Thyridosmylus langii*** MacLachlan

1870. *Osmylus langii* MacLachlan, *Entomologists mon. Mag.*, **6** : 197.

1913. *Thyridosmylus langii* Krüger, *Stettin. ent. Ztg.*, **74** : 87.

1942. *Thyridosmylus langii*, Kimmins, *Ann. Mag. nat. Hist.*, (11)**9** : 848.

1977. *Thyridosmylus langii*, Ghosh & Sen, *Rec. zool. Surv. India*, **73** : 286.

Diagnostic characters : Antenna : yellow with two basal joints pitchy black. Pronotum : with three transverse raised lines. Legs : yellow. Forewing (Pl. 23, fig. 3) : veins marked with piceous dots at hair bases; with fuscous marking - three large spots on costa; several spots near apex beyond pterostigma and between R & Rs; a large band near apex emitting three broad streaks - one entering apex and other two extending towards hind margin; other large spots present on cubito- anal area; two small spots - one near base and other at middle. Hindwing (Pl. 23, fig. 4) : hyaline. Abdomen : blackish dorsally.

Material examined : 2 exs., India : West Bengal, Darjeeling, Rabari, 16.v.1979 (coll. N. Pradhan).

Distribution : India (West Bengal : Darjeeling; Meghalaya).

*32(a) ***Thyridosmylus langii angustus*** Kimmins

1942. *Thyridosmylus langii angustus* Kimmins, *Ann. Mag. nat. Hist.*, (11)**9** : 849.

1973. *Thyridosmylus langii angustus*, Ghosh & Sen, *Rec. zool. Surv. India*, **73** : 286.

Diagnostic characters : The subspecies differs from typical form by the following characters : Wings : narrow and more acute; membrane of forewing less suffused with brownish markings colder in tone; fenestrate area between gradate series larger and dots of veins more well-marked; cells in centre of wings hexagonal rather than quadrate.

Distribution : India (Meghalaya).

Remarks : Due to the paucity of the material, the subspecies could not be examined. However, it has been reviewed from literature.

33. ***Thyridosmylus perspicillaris*** (Gerstaecker)

1884. *Osmylus perspicillaris* Gerstaecker, *Mt. Vorpomm. U. Rugen.*, **16** : 46.

1911. *Lysmus perspicillaris* Navas, *Rev. russe ent.*, **11** : 113.

1914. *Thyridosmylus perspicillaris* Krüger, *Stettin. ent. ztg.*, **75** : 56.

1962. *Thyridosmylus perspicillaris* Kimmins, *Ann. Mag. nat. Hist.*, (11)**9** : 815.

Diagnostic characters : Wings : membrane marked with brown particularly in apical and posterior areas in forewing but in hindwing, apical and posterior margin faintly marked with brownish; venation almost dark brown; hyaline areas of forewing without bluish pearly lustre; wings narrow and acute at apex.

Distribution : India (Sikkim).

Key to subspecies of the species ***T. perspicillaris***

Forewing heavily marked with brown particularly in apical and posterior areas. .... *minor* Kimmins

- Forewing not so heavily marked, membrane lightly washed with yellowish, apical and posterior areas clouded with brown. ..... *fenestratus* Kimmins

33(a) ***Thyridosmylus perspicillaris minor*** Kimmins

1942. *Thyridosmylus perspicillaris minor* Kimmins, *Ann. Mag. nat. Hist.*, (11)**9** : 815.

Diagnostic characters : Size : smaller than typical form. Wings : narrower and more acute at apex and more heavily marked than typical form; venation more open. Forewing : heavily marked with brown particularly in apical and posterior areas in comparison to typical form. Hindwing : clouded with brownish at apex and along posterior margin.

Material examined : 32 exs. (♂ ♀) : India, Sikkim, Toong, 31.vii.1959 (coll. A.G.K. Menon); Dirang, 21.vii.1961 (coll. S. Biswas); Singhik, 1386 m., 13.v.1962 (coll. S. Ali); Gangtok, 1740 m., 22.v.1962 (coll. G. Ramkrishna); East dist., Tumin 1800 m., 28-29.ix.1988 (coll. V.C. Agarwal); Umthang, 9.v.1989; 5 mile camp on Nathula Road east, 25.v.1989 and 5 kms. North-West of Lachen, 29.vii.1989 (coll. S.S. Saha and party).

Distribution : India (Sikkim).

33(b) ***Thyridosmylus perspicillaris fenestratus*** Kimmins

1942. *Thyridosmylus perspicillaris fenestratus* Kimmins, *Ann. Mag. nat. Hist.*, **11**(9) : 852-853.

1977. *Thyridosmylus perspicillaris fenestratus*, Ghosh & Sen, *Rec. zool. Surv. India*, **72** : 286.

Redescription : Head : yellowish brown; with a transverse stripe on each side in front of ocellar triangle extending upto each eye. Antenna : yellowish brown at base but with black flagellar segments. Pronotum : longer than broad with two pairs of black longitudinal spots and with long yellowish bristles. Meso- and metanotum : blackish. Wings : hyaline with subacute tip; cells in discal area approximately hexagonal. Forewing (Pl. 23, fig. 1 & Pl. 24, fig. 1) : pterostigma yellow with a dark spot on either side; membrane lightly washed with yellowish except hyaline fenestrate areas. Sc and R_1 with six pairs of black linear spots and subcostal space between each pair with blackish spot; majority of crossveins black and mostly surrounded by brownish clouds; base of inner gradate series, apical portion of third anal, forked veinlets at hind margin beyond middle of wing and also apex with prominent brownish clouds. Hindwing (Pl. 23, fig. 2 & Pl. 24, fig. 2) : six pairs of black linear spots in Sc and R_1 and with a blackish spot between each pair in subcostal space; brownish clouds prominent towards apex beyond pterostigma. Abdomen (Pl. 24, fig. 3) : black. Female genitalia (Pl. 24, fig. 4) : with gonapophysis lateralis rather slender and generally pointed towards apex; stylus at tip present; spermatheca as in Pl. 24, fig. 4.

Measurements : Length of forewing : 19 mm; hindwing : 18 mm.

Material examined : 2 exs. (♀♀) : India, Sikkim, Tumin, 1800 m., 28-29.ix.1990 (coll. V.C. Agarwal).

Distribution : India (Sikkim).

Remarks : Kimmins (1942) recorded the subspecies from South India. This is for the first time recorded from Sikkim. The description of the subspecies is given here in detail with the description and illustration of genitalia in female.

Family F. BEROTHIDAE

Diagnostic characters : Small lace-wings. Antenna : moniliform. Ocelli : absent. Wings : with quite a large number of veins; outer wing margins scalloped; without sensory spots; with 1-4 crossveins between R and Rs. Forewing (Pl. 11, fig. 3) : with some costal crossveins bifurcate; with a single sector arising from R near its base; with 1-4 crossveins between R and Rs; gradate veins present. Hindwing : Cu_1 running for a long distance close to hind border. Legs : normal.

Remarks : Only a single genus is so far reported from India which is dealt with here.

Genus 21. ***Berotha*** Walker

1860. *Berotha* Walker, *Trans. ent. Soc. Lond.*, (2)**5** : 184.

1977. *Berotha*, Ghosh & Sen, *Rec. zool. Surv. India*, **72** : 281.

1983. *Berotha*, Aspock, *Ann. Naturhist. Mus.*, **84** : 463.

Type species : *Berotha insolita* Walker

Diagnostic characters : Antenna : reaching pterostigma of forewing in length. Wings : elongate with somewhat curved apex. Forewing : with a deep arched excision in posterior margin near apex (*B. insolita*); one row of gradate crossveins. Legs : long and pilose. Male genitalia : 9th tergite and ectoproct fused to form a single sclerite; 9th sternite small; 9th coxopodite basally stalked but apically hooked.

Distribution : The distribution of the species is restricted to Oriental region (India, Sri Lanka, Java).

Remarks : Only a single species is so far reported from India which is dealt with here.

*34. ***Berotha insolita*** Walker

1860. *Berotha insolita* Walker, *Trans, ent. Soc. Lond.*, (N.S.)**5** : 187.

1983. *Berotha insolita*, Aspock, *Ann. Naturhist. Mus.*, Bd. **84** : 465.

Description : (Vide Aspock, 1983) "Ad Holotypus : Am dem abdomenlosen Tier ist nicht mehr feststellbar, obes Sich, wei bei der Beschreibung angegeben, um ein ♀ handelt. Da jedoch

fast alle früheren Autoren die (♀) Hypocauda der Berothidae fur (♂) Anhange hielten, ist der Holotypus von *B. insolita* wahrscheinlich ein (♂). Kopf und thorax mit verklebter Behaarung, fur Darstellung ungeeignet, Proportionen stimmen mit verglichenem (♂) uberein. Flugelgeader : Pterostigma in beiden flügeln ungebogen vorderflugal (Lange : 9,8 mm) : Langsadern gelb, nur Endverzweigungen braun, proximal mit dunkelbraunen Punkten, restliche Lange mit dunkel braunen Strichen; queradern hellbraun, nur distale geschattet; pterostigma in äuberer Hälfle abrupt verbreitert, rotbraun gefleckt mit heller zone in der Mitte, Hinterflugel : Adern gelb und hellbraun, ohne dunkel Fleckung; nur distale Querader zwischen R und Rs geschattet; pterostigma nur schwach verbreitert, lodiglich entlang der Geäderverzweigung rotbraun gepunktet, Keine geschlossene Fleckung.

Ad (♂) : Das flügelgeäder (Vorderflügellange : 8 mm) stimmt mit dem Holotypus überein, ist jedoch Kontrastreicher gefärbt; regelmäBige Beborstung erhalten, auBerdem besonders abstehende Borstenbüschel entlang der quer aderndes Vorder flugels.

(♂) genital segmente : Abdomen einschlieBlich der Genitalsegmente schwach sklerotisiert; 8. Tergit lateral verlängert, nicht eindeutig abgegrenzt; 8. sternit verkürzt, mit zu 2 kurzen Streifen reduzierter Querleiste; 9. tergit mit Ektoprokt zu einem Sklerit verschmolzen, Trichobothrien unscheinbar; 9. Sternit schmal, Kaudal mit verdickten Borsten; 9. Koxopoditen basal stielforming, apikal hakig umgebogen, mit Borstengruppe; Gonarcus unpaar, spangenformiger Bogen, mit 9. Koxopoditen verschmolzen; Parameren Mediuncus - Komplex unpaar, halbkreisformiger aus fadigen elementen zusammengesetzter Bogen, mit breiterem Basalstuck; Hypandrium internum relative grob."

Distribution : India (Meghalaya; "Hindostan"; West Bengal; Karnataka; Arunachal Pradesh : Abor). Elsewhere : Burma.

Remarks : The species may be readily recognised by i) deep arched excision specially in the forewing (Pl. 11, fig. 3) at the posterior margin near apex, ii) pterostigma in both wings bent inwards iii) male genetalic armature specially the band-like gonarcus and formation of half circle by the paramere - Mediuncus - complex. The species though studied by the author from other states of India but it is not available from North-East India. Therefore it has been reviewed from literature.

Family G. CHRYSOPIDAE

The chrysopids, popularly known as green lacewings, are predators on various insect pests of agriculture and other plantations. The group thus attracted the attention of systematics for a long time.

Diagnostic characters : Adults medium-sized with a length of forewing 6.5-35 mm. Maxillary palpi : 5-segmented and second segment always short. Labial palpi : 3-segmented. Mandibles well-developed. Pronotum : either transverse or longer than wide at base and without lateral projection. Meso- and metathorax : prescutum of mesothorax large, divided by a suture longitudinally into two halves; meso- and metascutum constricted at middle forming thereby narrowly separated lobes. Legs : slender, hind pair longer than other two pairs; tarsi 5-segmented

with a pair of curved claws. Wings (Forewing, Pl. 16, fig. 1) : large, usually subequal, pterostigma present but sometimes indistinct, microtrichiae only on a short area in anal angle of forewing and margin with dense fringes but without trichosors, usually without wingcoupling apparatus; humeral veinlet not recurrent; subcostal area of forewing usually with a single basal crossvein (bs) and a few apical ones in the pterostigmatic region; Sc long reaching wing margin beyond pterostigma; radius (R) long, parallel and close to Sc; radial sector (Rs) single; media (M) usually forked; intramedian cell (im) of different shapes usually present; two cells (m_1 & m_2) between M and Cu_1; pseudomedia (psm) formed by the fusion of M beyond im with the branches of Rs usually straight; cubitus 1 and Cubitus 2 (Cu_1 & Cu_2) arising from a common stem; Cu_1 & Cu_2 enclosing three cells; beyond the cell m_2, Cu_1 fused with the branches from median to form pseudocubitus (psc). Abdomen : usually cylindrical or nearly so; 8 pairs of spiracles; cercal callus and trichobothria present; gonarcus and hypandrium internum in male genitalia and spermatheca in female always present.

The family includes three subfamilies, namely, Nothochrysinae, Chrysopinae and Apochrysinae of which the last two are dealt with.

Key to subfamilies of the family CHRYSOPIDAE

1. Forewing with basal subcostal crossvein; cell im present; flagellar setae in four (or less) rings..... *Chrysopinae* Esben-Petersen
- Forewing without basal subcostal crossvein; without cell im; flagellar setae in five rings. ..... *Apochrysinae* Handlirsch

Subfamily a. CHRYSOPINAE

Key to genera of the subfamily CHRYSOPINAE

1. Sc very short; 1-2 crossveins below pterostigma. ..... *Ankylopteryx* Brauer
- Sc long; at least 3-4 crossveins below pterostigma. 2
2. Three or more series of gradate crossveins in forewing. 3
- Two series of gradate crossveins in forewing. 4
3. Scape grossly enlarged; costa convex in hinding. ..... *Tumeochrysa* Needham
- Scape as broad as long or slightly elongate; costa straight in hindwing. *Chrysopidia* Navas
4. Cell im quadrangular. ..... *Stigmachrysa* Navas
- Cell im ovate or triangular. 5
5. Cell im long; paramere present. ..... *Italochrysa* Principi
- Cell im short; paramere absent. 6
6. With tignum in male. ..... *Mallada* Navas
- Without tignum in male. 7

7. Forewing marked extensively with black and pale brown spots. ..... *Glenochrysa* Esben-Petersen

- Forewing unmarked or markings restricted to small spots near pterostigma. 8

8. Basal inner gradate not meeting Psm in forewing. 9

- Basal inner gradate meeting Psm atleast in one wing. 10

9. Genitalia in male with gonapsis. ..... *Apertochrysa* Tjeder

- Genitalia in male without gonapsis. ..... *Brinckochrysa* Tjeder

10. With arcessus. 11

- Without arcessus. ..... *Chrysopa* Leach

11. Arcessus large, broad, axe-shaped in lateral view. ..... *Cunctochrysa* Holzel

- Arcessus narrow, tapering apically. 12

12. Antenna shorter than forewing; frons unmarked; apodeme of sternite 8+9 with prominent apical tooth; male genitalia with median plate and membranous sac dorsal of arcessus. ..... *Retipennia* Brooks

- Antenna longer than forewing; frons marked with a row of 2-3 black spots below antennae; apodeme of sternite 8+9 short, not projecting; male genitalia without median plate and dorsal sac. ..... *Semachrysa* Brooks

Genus 22. ***Ankylopteryx*** Brauer

1864. *Ankylopteryx* Brauer, *Verh. zool. Bot. Ges. Wien*, **14** : 899.

1952. *Ethiochrysa* Fraser, *Rev. Franc. Ent.*, **19** : 57.

1954. *Leucochrysa* Fraser, *Nat. Malgache*, **3** : 16.

1990. *Ankylopteryx*, Ghosh, *Rec. zool. Surv. India*, *86*(2) : 341.

Type species : *Chrysopa venusta* Hagen

Diagnostic characters : Forewing : very broad especially at base, from where costa originating very steeply; Sc and R very close upto pterostigmatic region and then suddenly diverging; radial cross vein placed near base of wing; Rs arising at level with or beyond the fork of M; im ovate or elongate and in oblique position; second medio-cubital crossvein located distad of the furcation of M; two series of gradate crossveins; psm merges with outer gradates. Hindwing : narrow; costal area narrow; frenulum present as a small lobe with some stiff hairs. Legs : very short and slender. Abdomen : Male with sternite 8 and 9 and also tergite 9 and ectoprocts fused. Male genitalia : gonarcus arch-shaped; entoprocessus present; gonosaccus very long; hypandrium internum and comes present; tignum and gonapsis lacking. Female : tergite 8 not prolonged downwards laterally; tergite 9 and ectoproct fused; subgenital bilobed; spermatheca flattened with indistinct vela and without ventral impression.

Distribution : Africa, China, Cambodia, India, Malagasy, Malaysia, the Philippines, Singapore, Taiwan.

Remarks : Amongst a total of three species recorded so far from India, only two are dealt with hereunder.

Key to the species of the Genus ***Ankylopteryx*** Brauer

Pronotum with antero-lateral spot; presence of black point at the end of both marginal and costal cross veins of forewing. ..... *octopunctata* (Fabricius)

Pronotum without antero-lateral spot; absence of black points at the end of both marginal and costal cross veins of forewing. ..... *tesselatus* Needham

35. ***Ankylopteryx octopunctata*** (Fabricius)

1793. *Hemerobius octopunctatus* Fabricius, *Ent. Syst.*, **2** : 85.

1798. *Hemerobius candidus* Fabricius, *Ent. Suppl.* : 202.

1851. *Chrysopa candida* Schneider, *Mon. Chrysop.* : 261.

1864. *Ankylopteryx candida*, Brauer, *Verh. zool. bot. Ges. Wien*, **14** : 901.

1858. *Chrysopa punctata* Hagen, *Syn. Neur. Ceyl.* **1** : 483.

1864. *Ankylopteryx punctata* Brauer, *Verh. zool. bot. Ges. wien.*, **14** : 901.

1853. *Hemerobius trimacula* Girard, *Ann. Soc. Ent. Fr.*, (3)**87** : 163.

1864. *Ankylopteryx anomala* Brauer, *Novara Exp. Zool.*, **2** : 85.

1893. *Ankylopteryx octopunctata* Weele, *Notes Leyden. Mus.*, **31** : 57.

1990. *Ankylopteryx octopunctata*, Ghosh, *Rec. zool. Surv. India*, **86**(2) : 342.

Diagnostic characters : Mouth : dark. Thorax : pronotum with some dark spots laterally. Forewing (Pl. 18, fig. 2) : costa steep at base; with a dark spot over lower base of inner gradate series, pterostigma and near end of anal vein; with black points at the end of both marginal and costal crossveins of forewing.

Material examined : 6 exs. (♂♀) : India, Meghalaya, East Garo Hills, Darugiri forest Rest House, 1.iii.1983 (coll. R.K. Ghosh and party); 2 exs., West Bengal, Darjeeling district, Siliguri, Milanpalli, 23.ix.1996; 1 ex., Sevoke Road, 26.ix.1996; 1 ex., Dabgram, 1.x.1996; 1 ex., Sukna forest, 25.ix.1996 (coll. S.K. Ghosh).

Distribution : India (Meghalaya, West Bengal : Darjeeling dt., Himalayas, South India and Andamans) and Insulinde.

36. ***Ankylopteryx tesselatus*** Needham

1909. *Ankylopteryx tesselatus* Needham, *Rec. Indian Mus.*, **3** : 205.

1900. *Ankylopteryx tesselatus*, Ghosh, *Rec. zool. Surv. India*, **86**(2) : 344.

Diagnostic features : Vide Key.

Material examined : 1 ex., India. Assam, Sibsagar, no date (coll. S.E.P.).

Distribution : India (Assam).

Remarks : The specimen in the National Zoological collections is badly damaged. characters as shown in the key and also the large and conspicuous pterostigma are the salient features to consider it a good species.

Genus 23. ***Tumeochrysa*** Needham

1909. *Tumeochrysa* Needham, *Rec. Indian Mus.*, **3** : 204.

1910. *Chrysoplecta* Navas, *Broteria*, **9** : 55.

1940. *Tumeochrysa*, Banks, *Proc. U.S. natn. Mus.*, **88** (3079) : 187.

1990. *Tumeochrysa*, Ghosh, *Rec. zool. Surv. India*, **86**(2) : 345.

Type species : *Tumeochrysa indica* Needham

Diagnostic characters : Antenna : about as long as the body, shorter than wings; with huge, erect basal segments. Wings : costal area very narrow at base, then gradually widening. Forewing : Cu bending down to hind margin before apical third of the wing; 3rd cubital cell obliquely divided with the vein ending in its upper margin; more than two rows of irregular gradates which are many. Leg : hind tibia more than three times as long as hind tarsus.

Distribution : China and India.

Remarks : Only two species hitherto recorded from India are dealt with hereunder.

37. ***Tumeochrysa indica*** Needham

1909. *Tumeochrysa indica* Needham, *Rec. Indian Mus.*, **3** : 204.

1990. *Tumeochrysa indica*, Ghosh, *Rec. zool. Surv. India*, **68**(2) : 346.

Diagnostic characters : Frons, clypeus, labrum and vertex : yellow. Antennae : yellowish brown with basal segment swollen, erect and approximate to each other. Thorax : darker dorsally but yellow ventrally and tinged with reddish on principal convex areas. Wings : hyaline, unmarked, with subacute tip; veins and crossveins mainly yellow, pterostigma yellowish. Forewing (Pl. 17, fig. 1) : im ending after first crossvein of Rs. Abdomen (Pl. 17, fig. 2) : blackish-brown dorsally but yellow ventrally; all segments with yellowish pubescens. Female genitalia : subgenital plate (Pl. 17, fig. 3) : small. its distal margin deeply emarginate; spermatheca (Pl. 17, fig. 4) large, strongly chitinised with vella acute at tip.

Material examined : 2 exs. (♀♀) : India, Manipur, Ukhrul, 6200 ft., Inspection Bungalow, 3.x.1975 (coll. M.S. Shishodia).

Distribution : India (Manipur; Western Himalayas : Kumaon, Bhimtal).

*38. *Tumeochrysa cirerai* (Navas)

1930. *Chrysoplecta cirerai* Navas, *Rev. Acad. Sci.*, **13** : 43.

1990. *Tumeochrysa cirerai*, Ghosh, *Rec. zool. Surv. India*, **86**(2) : 346.

1992. *Tumeochrysa cirerai*, Singh and Uma Narasimham, (compilation) in Indian Chrysopidae, *Tech. Bull.* no. *5*, ICAR : 22.

Distribution : India (Sikkim).

Remarks : Due to the paucity of the material and relevant literature, the diagnostic characters are not possible to include under the species. However, Singh and Uma Narasimham (1992) reported the species from Sikkim.

Genus 24. *Chrysopidia* Navas

1910. *Chrysopidia* Navas, *Broteria*, **9** : 54.

1990. *Chrysopidia*, Ghosh, *Rec. zool. Surv. India*, **86**(2) : 344.

Type species : *Chrysopidia nigrata* Navas

Diagnostic characters : Mandibles symmetrical or asymmetrical. Forewing : 12 to 20 mm; without jugal lobe; costal field broad; only a single basal crossvein between Sc and R; apex of im ending beyond 1st r-m crossvein; three rows of gradate crossveins. Hindwing : with feebly developed frenulum; M and R occasionally fused; 3 rows of gradates. Abdomen : tergite 9 and ectoproct in both sexes fused. Male genitalia : sternite 8 and 9 in males completely fused, elongated and small; gonarcus and arcessus attached together.

Distribution : India and Nepal.

Remarks : Only four species are so far reported from India which are dealt with here. The species, *C. numerosa* Navas and *C. fuscata* Navas were described by Navas (1914) without considering the genitalic characters in males. Due to inadequate description, Holzel (1971) proposed to consider the species as Nomina dubia. Brooks and Barnard (1990) in the checklist of extant species of the world chrysopidae considered them as good species.

Key to subgenera of the genus *Chrysopidia*

With straight radial crossvein; tignum and gonapsis in male genitalia present. .... *Anachrysa* Holzel

- With sinuate radial crossvein; tignum and gonapsis in male genitalia lacking. .... *Chrysopidia* Navas

Subgenus 1. *Anachrysa*

1973. *Anachrysa* Holzel, *Ergebnisse des Forschungsunternehmens Nepal Himalaya. Khumbu Himal.*, **4**(3) : 356.

Diagnostic characters : Vide Key.

Distribution : India (Assam, Arunachal Pradesh). Elsewhere : Nepal and Western Himalaya.

Remarks : Only a single species of the subgenus is for the first time recorded from Arunachal Pradesh.

39. ***Chrysopidia (Anachrysa) garhwalensis*** Ghosh

1985. *Chrysopidia garhwalensis* Ghosh, Bull. zool. Surv. India, 7(2-3) : 217.

Diagnostic characters : Labial and maxillary palpi : black at tip. Labrum, Clypeus, frons and vertex : yellow. Gena : with a black stripe. Thorax : yellowish. Wings : (Pl. 18, figs. 4-5) : unmarked; longitudinal veins greenish yellow. Forewing : costals black before pterostigma, first and second series of gradate crossveins black; pterostigma yellowish with a smoky patch at base; intramedian cell elongate with its tip reaching beyond first radio-medial crossvein. Male genitalia (Pl. 18, figs. 6-8) : gonarcus arch-shaped with narrow central portion and slender lateral pieces, entoprocessus small; arcessus long, acute at tip; tignum shallowly arched with acute acumen; gonapsis with robust central piece and almost triangular lateral pieces.

Material examined : 1 (♂), India, Arunachal Pradesh, W. Kameng, Jegong, Rupa, 13.x.1996 (coll. S.K. Mandal).

Distribution : India (Uttar Pradesh and Arunachal Pradesh).

Remarks : The species has been reported from Gangotri, N.W. Himalayas by Ghosh (1985). This is for the first time recorded from Arunachal Pradesh. In this connection it may be pointed out that in Arunachal Pradesh specimen pronotum is without any reddish shade laterally.

Subgenus 2. ***Chrysopidia*** Navas

1910. *Chrysopidia* Navas, Broteria, **9** : 54.

Diagnostic characters : vide Key.

Distribution : Eastern Palaearctic and Oriental including India (Sikkim, West Bengal and Manipur).

Remarks : Four species of the subgenus are dealt with here.

Key to species of the subgenus ***Chrysopidia***

1. Antenna with red stripe. 2
- Antenna without red stripe. ..... *numerosa* Navas
2. Thorax with yellowish dorsal fascia. ..... *nigrata* Navas
- Thorax yellow but without dorsal fascia. 3

3. Pronotum with dorsal red stripe; gradates and some of the marginal forks fuscous..... .....*fuscata* Navas

- Pronotum yellow and without dorsal red stripe; gradates and some of the marginal forks black.. ..... *manipurensis* Ghosh

*40. ***Chrysopidia (Chrysopidia) numerosa*** Navas

1914. Chrysopidia numerosa Navas, Rev. russe. ent., **14** : 11.

1990. *Chrysopidia numerosa*, Ghosh, *Rec. zool. Surv. India,* **86**(2) : 345.

1990. *Chrysopidia numerosa*; Brooks & Barnard, *Bull. Br. Mus. nat. Hist.* (Ent.) **59**(no. 2) : 271.

Description : As the material has not been studied the description as given by its author (Navas, 1914) is noted below :

"Testaceo flava. Caput oculis in sieco aeneo-testaceis; antennis flavis, articulo primo cylindrico, longo, externe linea longitudinali fuscescente signato. Prothorax transversus. Abdomen inferne flavum. Pedes flavidi, fusco pilosi; tibis posticis leviter compressis, linea impressa longitudinali distincta, longa; unguibus basi fortiter dilatatis. Alae longae, acutae, hyaline, irideae; reticulatione et stigmate viridi-flavis; furcis marginalibus longiusculis. Ala anterior area costali in triente basilari dilatata; venulis gradatis 14-9-11, fuscis, externis (duobus primis exceptis) viridi-flavis; venulis intermediis 5, prima ad medium cellulae fusiformis vel ultra veniente venula prima radialis, duae primae intermediae, duae ultemae procubitalis et prima cubitalis totae, tres radiales et sector radii Initio, fuscae. Interdum aliqua venula inter series normales gradatarum interjecta. Ala posterior area radiali ad medium leviter dilatata; venulis radialibus primis versus ortum sectores, ultimis versus stigma tendentibus; venulis gradatis 12-6-10. Long. corp. 15 mm. al. ant. 21 mm. al. post. 18 mm. Patra. Himalaya : Darjeeling. 1910 (Col. m., de joannis ded)."

Distribution : India (West Bengal : Darjeeling).

Remarks : The characters of the species as given by Navas (1914a) are not convincing to make any comment on the species. Detailed study of male genitalia is essential for the confirmation of species identity.

41. ***Chrysopidia (Chrysopidia) nigrata*** Navas

1910. *Chrysopidia nigrata* Navas, *Broteria,* **9** : 55.

1971. *Chrysopidia nigrata*, Holzel, *Wien. Z. Arbeit. Ost. Ent.,* **23**(2) : 57.

1990. *Chrysopidia nigrata*, Ghosh, *Rec. zool. Surv. India,* **86**(2) : 345.

Diagnostic characters : Antenna : scape, pedical, basal segments of flagellum with red stripe. Thorax : with yellowish dorsal fascia. Forewing : membrane hyaline, unmarked, crossveins in the costal field at both ends and gradates black. Gradates in both wings with 3 rows (Pl. 19, figs. 2-3). Abdomen : brown with yellow dorsal fascia; ectoproct fused with tergite 9; sternite 8+9 fused. Male genitalia : gonarcus arcuate; entoprocessus triangular, short and basally bifurcate, arcessus

long, tapering apically; gonosaccus large with long gonosetae. Female genitalia : subgenital bilobed; spermatheca with long vela.

Material examined : 5 exs., (♂ ♀) : 2 exs., India, Sikkim, East dist., Tumin, 1800 m. (coll. V.C. Agarwal); 2 exs., Todong, I.C.A.R. Rest House, 28.v.1994 (coll. G.C. Sengupta and party); 1 ex., Manipur, Mao, 12.ix.1975 (coll. V.C. Agarwal and party).

Distribution : India (West Bengal : Darjeeling, Manipur and Sikkim).

Remarks : The species is for the first time recorded from Sikkim and Manipur. It is included in the subgenus *Chrysopidia* by the presence of three gradate series (two in subgenus *Chrysotropia*) and also by the absence of tignum and gonapsis (present in *Anachrysa*).

*42. ***Chrysopidia (Chrysopidia) fuscata*** Navas

1914. *Chrysopidia fuscata* Navas, *Rev. russe Ent.*, **14** : 12.

1940. *Chrysopidia fuscata*, Banks, *Proc. U.S. Nat. Mus.*, **88** : 188.

1990. *Chrysopidia fuscata*, Brooks & Bernard, *Bull. Br. Mus. nat. Hist.*(Ent.), *59* (no. 3) : 271.

Description : Original description (Navas, 1914) is noted below :

"Similis *nigratae* Nav. caput flavum; antennis duobus articulis (Ceteri desunt) stria longitudinali externa rubra; oculis in sicco fuscis. Thorax flavus. Prothorax fere latior quam longior, superne stria rubra notatus. Mesonotum puncto laterali rubro. Abdomen flavidum, flavido pilosum. Pedes flavo-viridis, apice tibiarum et tarsis flavescentibus; tibiis posticis compressis, linea impressa longitudinali longa, recta. Alae hyalinae, irideae; reticulatione viridi; stigmate elongato, viridi. Ala anterior apice rotundata, area costali prope basin ampliata; venulis radialibus primis versus ortum sectoris, mediis versus stigma inclinatis; venulis gradatis fere 8 - 3 - 8, intermediis 7, prima ad trientem apicalem cellulae fusiformis anguste veniente. Venulae gradatae total, reliquae fere omnes initio et fine, furculae marginalis in ipso margine et ad ortum rami anterioris, fuscae. Margo posterior rectus vel leviter concavus, longus. Ala posterior basi angusta, in triente apicali lata, apice acuta; ramis furcularum ad marginem externum verientium et ipso margine, fuscis; axillis earundem furcularum et reliqua reticulatione viridibus. Venulae gradatae 8 - 2 - 9. Long. crop. 11, 4 mm. al. ant. 17,5 mm. al. post. 15 mm. Patria. China : Tali, Yunnam; Himalaya, Darjeeling (col. m., de Joannis ded.)."

Distribution : India (West Bengal : Darjeeling). Elsewhere : China.

Remarks : A more or less distinct reddish marks on the outer side of the basal joint of the antennae; yellow thorax but without yellowish dorsal fascia and pronotum with reddish marks; fuscous gradates and some of the marginal forks are some of the important characters for distinguishing the species from its nearest allies. Banks (1940) reported that the inner gradates of the species are not extended basally and not parallel to other rows.

43. ***Chrysopidia (Chrysopidia) manipurensis*** Ghosh

1990. *Chrysopidia manipurensis* Ghosh, Rec. zool. Surv. India, **86**(2) : 344.

Diagnostic characters : Labrum, clypeus and frons; pale yellowish. Antenna : basal segment yellow; a red line on outer side of basal segment. Vertex : yellow. Pro-meso-, metanotum : yellow. Wings (pl. 17, figs. 5-6) : unspotted. Forewing : costals and radials partially black, gradates and some of the marginal forks black, pterostigma yellowish; 3 rows of gradate crossveins of which inner gradates extending basally. Abdomen : tip as in Pl. 17, fig. 8. Male genitalia (Pl. 17, fig. 7) : gonarcus with expanded side pieces; entoprocessus 'Y' - shaped, arcessus short, narrowed at base and expanded at apex with three distinct dents.

Material examined : Holotype, male : India, Manipur, Mao, Inspection Bungalow, 12.iv.1975 (coll. M.S. Shishodia).

Distribution : India (Manipur).

Genus 25. ***Stigmachrysa*** Navas

1925. *Stigmachrysa* Navas, *Ann. Soc. Sci. Bruxelles,* **44** : 570.

1990. *Stigmachrysa,* Brooks and Barnard, *Bull. Br. Mus. nat. hist. (Ent.),* **59** (no. 2) : 183.

Type species : *Stigmachrysa kervillei* Navas

Diagnostic characters : Forewing : broad, im quadrangular and broad; Sc & R widely separated at pterostigma; Rs slightly sinuate; gradates in two parallel or divergent rows; inner gradate series irregular with additional crossveins and extended basally, meeting Psm. Male genitalia : ectoproct with ventro-apical projection; Sternite 8 + 9, fused; gonarcus broad with long, tapering, lateral gonocornua; arcessus with hooked apex; entoprocessus, gonapsis, tigmum, median plate, pseudopennis absent. Female genitalia : subgenital bilobed, apically with small median projection and basal crumina; spermatheca short and broad; vela enormously elongated and coiled.

Distribution : India (Sikkim). Elsewhere : Burma; Singapore; Java.

Remarks : Single species was so far reported from India which is dealt with.

*44. ***Stigmachrysa cladostigma*** (Navas)

1913. *Nothochrysa cladistigma* Navas, *Rev. russe Ent.,* **13** : 426.

1990. *Stigmachrysa cladostigma* Brooks and Barnard, *Bull. Br. Mus. nat. Hist. (Ent.),* **59** : no. 2.

Diagnostic characters : Forewing : broad, unmarked; costal area narrow at base; im quadrangular; gradates in two rows; inner gradates extended basally, meeting Psm. Male genitalia : gonarcus short, broad with long tapering lateral gonocornua; arcessus short broad with hooked apex, parameres short, arcuate, bearing short setae; gonocristae present in small group at apex of sternite 8 + 9. Female genitalia : subgenital broad, bilobed apically.

Distribution : India (Sikkim).

Remarks : Singh and Uma Narasimham (1992) noted the place of record as "Sikkim." However, the material is not available for study. So, the diagnostic characters of the species have been given on the basis of illustration given by Brooks and Barnard (1990).

Genus 26. ***Italochrysa*** Principi

1946. *Italochrysa* Principi, *Boll. Ist. Ent. Univ.* Bologna, **15** : 86.

1990. *Italochrysa*, Ghosh, *Rec. zool. Surv. India*, **86**(2) : 332.

Type species : *Hemerobius italicus* Rossi

Diagnostic characters : Usually large-sized robust species. Antenna : stout and flagellum with four concentric fings of short setae. Forewing : jugal lobe lacking; cell im usually subquadragular; basal crossvein in subcostal area located about midway between first medio-cubital crossvein and furcation of M; Cell m_2 longer than m_1; psm merging with outer gradate series; Abdomen : sternite 8 and 9 fused. Male genitalia : gonarcus without entoprocessus; arcessus large and toothed at apex; paramere long and united at base; hypandrium internum with large comes. Female genitalia : subgenital long, weak tube with a pair of apical lobes and ventral ridge; spermatheca large with large vela and usually deep ventral impression.

Distribution : Abyssinia, Central and South Africa, Japan, Palestine, Iran, India, the Sunda Islands, China and Australia.

Remarks : Principi (1946) erected this genus. Ghosh (1981a) described a species in this genus. Altogether eight species including two indetermined ones are reported from the area under consideration of which *I. stitzi* and *I. talaverae* are not included in the key due to nonavailability of the material and literature. Indetermined species have also been excluded from the key.

Key to species of the Genus ***Italochrysa***

1. Antenna black except yellowish basal segments. 2
- Antenna not black but brownish. ..... *robusta* (Needham)
2. Pronotum with a broad red brown stripe on either side. ..... *carletoni* Banks
- Pronotum yellow, without red brown stripe. 3
3. Forewing without black crossveins; pterostigma diffuse. ..... *lefroyi* (Needham)
- With black crossveins, pterostigma brownish. ..... *flavobrunnea* Ghosh

45. ***Italochrysa robusta*** (Needham)

1909. *Nothochrysa robusta* Needham, *Rec. Indian Mus.*, **3** : 202.

1990. *Italochrysa robusta*, Ghosh, *Rec. zool. Surv. India*, **86**(2) : 333.

Diagnostic characters : Head : brownish. Antenna : brownish with four concentric rings of short setae. Pronotum : broader than long with front angles eroded and hind angles squared. Wings : without spot; pterostigma long and pale-yellowish. Forewing (Pl.19, fig. 1) : cell im long, subrectangular; costal crossveins pale yellow with several crossveins with black ends; crossveins between R & Rs, two radio-medial crossveins, 1st crossvein between Psm & M_2 , three cubital crossveins and both inner and outer gradates black; branches of Rs basally black; crossveins between Psm and Psc black at each end; marginal forks black. Hindwing : both inner and outer gradates yellow.

Measurements : Length of forewing, 30 mm., hindwing, 25 mm.

Material examined : 1 ex., (female) : India, Assam, Sibsagar (coll. S.E. Peal), Reg. no. 9899/15. 1 ex. (damaged) : Tezpur, 3.iii.1973 (coll. S.K. Tandon and party).

Distribution : India (Assam).

*46. ***Italochrysa carletoni*** Banks

1939. *Nothochrysa carletoni* Banks, *Bull. Mus. Comp. Zool. Harv.*, **85**(7) : 472.

1990. *Italochrysa carletoni*, Ghosh, *Rec. zool. Surv. India*, **86**(2) : 351.

Diagnostic characters : Head : yellowish, unmarked. Antenna : black except yellowish basal segments. Pronotum : with a broad red brown stripe on either side. Forewing : costal veins, radials and branches of radial sector in part and inner gradates dark; pterostigma long and yellowish; outer gradates pale and meeting Psm. Hindwing : inner gradates, radial sector and its branches brown; a brownish spot between IA and first branch of cubitus. Outer gradates in both wings nearer to margin than inner row.

Distribution : India (Kulu, W. Himalayas and Sikkim).

Remarks : The material is not available for study and so it is reviewed from the literature.

*47. ***Italochrysa lefroyi*** Needham

1909. *Nothochrysa lefroyi* Needham, *Rec. Indian Mus.*, **3** : 203.

1900. *Italochrysa lefroyi*, Brooks & Barnard, *Bull. Br. Mus. nat. Hist. (Ent.)*, **59**, no. 2 : 267.

Diagnostic characters : Face : tawny yellow with reddish-brown lines on sutures. Antenna : black except a couple of yellowish basal segments. Pronotum : tawny yellowish with a median longitudinal sulcus; front angles eroded. Wings : veins tawny yellow; crossveins not black; pterostigma long and diffuse.

Distribution : India (Bihar, Punjab, Assam, Meghalaya, W. Himalayas).

Remarks : The species is not available for study so it is reviewed from the literature.

48. *Italochrysa flavobrunnea* Ghosh

1981. *Italochrysa flavobrunnea* Ghosh, *Bull. zool. Surv. India*, **3**(3) : 145.

Diagnostic characters : Female : Vertex, clypeus and frons : yellow. Antenna : scape and pedicel yellow but flagellum black. Pro-, meso- and metanotum : yellow; mesonotum with blackish markings on anterior margin of prescutum; both meso- and metanotum with blackish markings on hinder part and anterior part of scutum and scutellum. Wings (Pl. 21, figs. 1-2) : unmarked. Forewing : unmarked, but portion of Rs beyond middle, crossvein between cell m_1 and m_2, basal cubital crossvein and all gradates in inner and distal five in outer row black; pterostigma brownish. Legs : femur yellow with a blackish spot before apex; tibia yellow; both fore femur and fore tibia with a longitudinal brown line at inner side. Abdomen (Pl. 21, fig. 3) black but apex of each segment yellow; tergite 9 + ectoproct with narrow dorsal portion and expanded lower portion. Female genitalia : subgenital bilobed; spermatheca with short vella.

Material examined : 2 exs., India, Meghalaya, Shillong, Barapani, 1.x.1991 (coll. R.K. Varshney, S.K. Ghosh and I.J. Gupta).

Distribution : India (Meghalaya; Tamil Nadu and Madhya Pradesh).

Remarks : The species is for the first time recorded from Meghalaya.

*49. *Italochrysa stitzi* (Navas)

1924. *Nothochrysa stitzi* Navas, *Rev. Acad. Cienc. Zaragoza*, **9** : 29.

1919. *Italochrysa stitzi* Brooks & Barnard, *Bull. Br. Mus. nat. Hist.* (Ent.) **59**(2) : 267.

1992. *Italochrysa stitzi*, Singh & Uma Narasimham, *Tech. Bull.* no. **5**, *ICAR*, p. 14.

Distribution : India (Sikkim).

Remarks : Due to the paucity of material and literature no further comment is possible on the species. However, Singh and Uma Narasimham (1992) reported the place of record as "Sikkim."

*50. *Italochrysa talaverae* Navas

1928. *Nothochrysa talaverae* Navas, *Bol. Soc. ent. esp.*, **11** : 133.

1990. *Italochrysa talaverae*, Brooks & Barnard, *Bull. Br. Mus. nat. Hist.*, (Ent.) **59**(2) : 267.

1992. *Italochrysa talaverae*, Singh and Uma Narasimham, *Tech. Bull., no.* **5**, ICAR, p. 14.

Distribution : India (Sikkim).

Remarks : Neither the specimen nor the original literature is available for study, so the author reserves his comment on the species.

51. ***Italochrysa*** sp. 1.

Head : vertex red. Frons, clypeus and palpi : reddish brown; Antenna : with scape and pedicel reddish brown but flagellum black. Pronotum : red with yellowish lateral and posterior margins. Mesonotum : black; prescutum with a yellow stripe on either side of median, longitudinal suture; scutum with a pair of yellow stripe on the inner side of convex areas which are connected by a transverse yellow stripe; scutellum yellow. Metanotum : black; scutum with a yellow patch at middle and scutellum yellow. Legs : yellow; all femora with a broad, black ring leaving only base and apex pale; tarsal segments reddish brown; claws red. Forewing (Pl. 20, fig. 1) : c, Sc and R pale; Rs with pale portions between the crossveins in inner half but blackish entirely in outer half; all but a few crossveins between R and Rs blackish; M and cell im pale; Psc pale; crossveins between C_1 and C_2 black; anal veins pale; both inner and outer gradates blackish; pterostigma pale brownish. Hindwing : venation chiefly pale. Abdomen : black; dorsum with yellowish markings at each segment. Male genitalia (Pl. 20, figs. 2-4) : gonarcus (fig. 4) with straight lower and emarginate upper margin; arcessus with a median rib; parameres (fig. 2) long, slender, acute at apex and without teeth or processes; inner prongs narrow; apophysis subtriangular; hypandrium internum and comes as in fig. 3.

Material examined : 1 ex., (male) : India, Mizoram, Aizwal, Lalon, 1.xii.1995 (coll. P. Parui and party).

Distribution : India (Mizoram).

Remarks : The species comes closer to *Nothochrysa henryi* Kimmins [= *Italochrysa henryi* (Kimmins)] but differs from it in genitalic characters in males as well as absence of mashroom-shaped yellow patch on pronotum. The species though interesting, is not being designated as a new species as the description is based only on a single, partially damaged specimen. However, the genus is for the first time recorded from Mizoram.

52. ***Italochrysa*** sp. 2.

Diagnostic characters : Head : yellow. Antenna : yellow. Pronotum : yellow with a rounded black spot on either side. Wings : hyaline, without spot; pterostigma pale. Forewing (P. 19, fig. 6) : cell im much narrower distally and subrectangular; outer gradates black with 7 and inner gradate with 6 crossveins. Hindwing : both inner and outer gradate with 5 crossveins. Legs : yellow with brown tarsi. Abdomen : brownish.

Material examined : 1 ex. India : West Bengal, Darjeeling, Singla, 16.iv.1973 (coll. H.S. Sharma and party).

Distribution : India (West Bengal).

Remarks : The description of this unidentified species has been provided by Ghosh (1990c) alongwith illustration of wings.

Genus 27. ***Mallada*** Navas

1925. *Mallada* Navas, *Rev. Acad. Cienc. Zaragoza*, **9** : 24.

1990. *Mallada*, Brooks and Barnard, *Bull. Br. Mus. nat. Hist.* (Ent.), **59**(2) : 223.

Type species : *Mallada stigmatus* Navas

Diagnostic characters : Forewing : SC and R widely separated; im short and ovate; gradates generally in two rows; inner gradate not usually meeting Psm. Hindwing : Sc and R narrow. Male genitalia : entoprocessus when present, short and straight; tignum and gonapsis present; arcessus narrow and tapering apically; without pseudopennis. Female genitalia : subgenital bilobed apically; spermatheca broad or narrow and likewise vela long or short.

Distribution : World wide including India.

Remarks : Only a single species of the genus is dealt with.

53. ***Mallada alcestes*** (Banks)

1911. *Chrysopa alcestes* Banks, *Proc. Ent. Soc. Wash.*, **13** : 102.

1990. *Mallada alcestes*, Brooks and Barnard, *Bull. Br. Mus. nat. Hist. (Ent.)*, **59**(2) : 273.

Diagnostic characters : Pronotum : broader than long. Wings : crossveins entirely black or black at ends only. Forewing : im ending at or beyond first crossvein between Rs and M_{1+2}; 5 black crossveins in inner and six in outer gradate series; inner row equidistant to Rs and outer gradate series. Hindwing : four crossveins in inner and 5-6 in outer gradate series. Male genitalia : gonarcus short, tignum arcuate; gonapsis with medial process apically expanded; entoprocessus short, arcessus narrow, tapering apically.

Material examined : 3 exs. (♀♀) : India, Meghalaya, Shillong, Risa colony, 27.vi.1971 (coll. S. Biswas) and lower Cherrapunji, 1300 m., 2.iv.1991 (coll. S.K. Ghosh and party); Mizoram, around Lawngtoli Circuit House, 1.iv.1994 (coll. A.K. Hazra and party).

Distribution : India (Meghalaya, Bihar and West Bengal).

Remarks : The species is for the first time recorded from Mizoram.

Genus 28. ***Glenochrysa*** Esben-Petersen

1920. *Glenochrysa* Esben-Petersen, *Ann. South Afr. Mus.*, **17** : 520.

1990. *Glenochrysa*, Ghosh, *Rec. zool. Surv. India*, **86**(2) : 337.

Type species : *Glenochrysa typica* Esben-Petersen.

Diagnostic characters : Wings : with brilliant irridescence and strongly marked; crossveins in pterostigmatic area; venation : Chrysoperla-type. Abdomen : spiracles in male small but with large atria; male genitalia : tignum absent; gonarcus with a pair of entoprocessus and an arcessus; with gonapsis.

Distribution : Africa, Sunda Islands, India, Australia, North America, West Indies.

Remarks : The genus *Glenochrysa* described by Esben-Petersen (1920) as a subgenus under the genus *Chrysopa*. The author after studying the wings and genitalia has considered *Glenochrysa* as a genus and a single species hitherto recorded from India has been dealt with under this taxon.

54. ***Glenochrysa marmorata*** (Needham)

1909. *Eremochrysa marmorata* Needham, *Rec. Indian Mus.*, **3** : 205.

1940. *Glenochrysa marmorata* Kimmins, *Ann. Mag. nat. Hist.*, (11)**5** : 449.

1990. *Glenochrysa marmorata*, Ghosh, *Rec. zool. Surv. India*, **86**(2) : 338.

Diagnostic characters : Vertex, gena and clypeus : brown. Antenna : yellow. Epicranium : a black stripe between antennae continuing along inner margin of toruli. Pro-, meso- and metanotum : yellow. Wings (Pl. 19, figs. 4-5) : beautifully marked; membrane hyaline, crossveins tinged with golden-brown, strongly on basal third of both wings and all about wing margins; weakly tinged over wing disc; brown on base of Rs, about pterostigma and dcc more pronounced than other places. Male genitalia : gonarcus with rounded lateral pieces. arcessus broad at base and narrow at apex; entoprocessus narrow.

Material examined : 1 ex., Assam, no other data.

Distribution : India (Assam, West Bengal, Andamans).

Remarks : The author has studied the specimens from three states (as shown above) and observed certain morphovariations, milk-white irregular spots in between branches of Rs towards apex in the specimen from Andaman are not found in the specimens from Assam and West Bengal.

Genus 29. ***Apertochrysa*** Tjeder

1955. *Apertochrysa* Tjeder, *South African Animal Life*, **12** : 480.

1990. *Apertochrysa*, Brooks and Barnard, *Bull. Br. Mus. nat. Hist. (Ent.)*, **59** (no. 2) : 187.

Type species : *Chrysopa umbrosa* Navas

Diagnostic characters : Mandibles : asymmetrical, left with basal tooth. Antenna : setae arranged in four rings. Wings : Sc with basal crossvein; im ovate; Rs sinuate; gradates in two parallel rows; basal inner gradate not meeting Psm. Male genitalia : gonarcus long and narrow; entoprocessus with median projection; arcessus narrow, tapering apically; without tignum but with gonapsis, median plate, pseudopennis. Female genitalia : subgenital apically bilobed; spermatheca narrow; vela large.

Distribution : Palaearctic and Palaeotropics.

Remarks : *A. kichijoi* (Kuwayama) was reported from Assam which is dealt with here.

55. *Apertochrysa ? kichijoi* (Kuwayama)

1936. *Chrysopa kichijoi* Kuwayama, *Zool. Mag.*, **48** : 817.

1990. *Apertochrysa kichijoi*, Brooks and Barnard, *Bull. Br. Mus. nat. Hist. (Ent.)*, **59**, no. 2 : 286.

Diagnostic characters : Head : with some blackish or fuscous markings. Antenna : second segment concolorous with first. Pronotum : with a large black triangular patch along front margin and blackish suffusion along hind margin. Forewing : first crossvein from Rs to Psm touching Psm before apex of median loop.

Material examined : 1 ex., (♀) : India, Mizoram, Saiha, 6.iv.1994 (coll. A.K. Hazra).

Distribution : India (Assam; Mizoram). Elsewhere : Japan (Hokkaido, Sapporo).

Remarks : Singh & Uma Narasimham (1992) reported this species from Assam. A single female specimen from Mizoram is available for study which is doubtfully identified as *kichijoi* and the genus alongwith the species is the first record for the state.

Genus 30. *Brinckochrysa* Tjeder

1966. *Brinckochrysa* Tjeder, *South Afr. Anim. Life*, **12** : 360.

1990. *Brinckochrysa*, Ghosh, *Rec. zool. Surv. India.* **86**(2) : 337.

Type species : *Chrysopa (Brinckochrysa) peri* Tjeder

Diagnostic characters : Antenna : little longer than forewing. Wing venation : Chrysoperla - pattern. Abdomen : ectoproct distinctly separated dorsally but completely fused with tergite 9 laterally and forming a lappet-like structure with the enlargement of ventral margin proximally. Male genitalia : without tignum, pseudopennis and gonapsis; gonarcus with a pair of entoprocessus and a spine-like arcessus.

Distribution : Micronesia, South Africa, Congo, Cape Verde Islands And India.

Remarks : Tjeder (1966) erected the subgenus under the genus *Chrysopa*. But the male genitalia is quite significant to raise the status to generic level. Only one species is so far recorded from India which is dealt with here.

56. *Brinckochrysa scelestes* (Banks)

1911. *Chrysopa scelestes* Banks, *Proc. ent. Soc. Wash.*, **13** : 103.

1959. *Chrysopa scelestes*, Adams, *Insects of Micronesia*, **8**, no. 2 : 28.

1966. *Chrysopa (Brinckochrysa) scelestes*, Tjeder, *South Afr. Anim. Life*, **12** : 361.

1990. *Brinckochrysa scelestes*, Ghosh, *Rec. zool. Surv. India*, **86**(2) : 337.

Diagnostic characters : Light green with pale yellow mid-dorsal stripe. Head : pale. Gena : reddish. Antenna : pale, fuscous at tip. Pronotum : broader than long. Wings : slender, pointed.

Forewing : second cubital cell hardly as long as third; im ending before crossvein or at it; 5-7 inner gradate veinlets, 6-8 outer gradates, inner row a little nearer to outer row than Rs; pterostigma inconspicuous. Hindwing : 5-6 inner gradates and 6-7 outer gradates. Male genitalia : gonarcus arched, entoprocessus narrow with lateral extension; arcessus narrow, tapering apically. Female genitalia : subgenital narrow, bilobed at apex; spermatheca narrow with long vela.

Material examined : 3 exs., (♀♀) : India, West Bengal, Darjeeling, Rangia forest Rest House, 5.iv.1973 (coll. H.S. Sharma); Manipur, Mao, 12.ix.1975 (coll. M.S. Shishodia and party); Tripura, Ambassa forest south, 17.xi.1974 (coll. M.S. Shishodia and party).

Distribution : India : West Bengal : Darjeeling; Manipur and Tripura. Elsewhere : Caroline and Mariana Island.

Remarks : The species is for the first time recorded from Manipur and Tripura. Singh and Uma Narasimham (1992) while showing the place of record of the species from Andhra Pradesh, Karnataka, Punjab, Uttar Pradesh raised the doubt regarding the identity of the species. Therefore, these states have been omitted in the distribution of the species. In the female specimens from Tripura, the number of inner gradates in both wings is 3 instead of 5-6.

Genus 31. ***Chrysopa*** Leach

1815. *Chrysopa* Leach, Artikel entomology-Brewster, *Edinburgh Encyclopaedia*, 9.

1990. *Chrysopa*, Ghosh, *Rec zool. Surv. India*, **86**(2) : 345.

Type species : *Chrysopa perla* (Linnaeus) *sensu* Schneider, 1851 (i.e. *Hemerobius chrysops* Linnaeus, 1758, *sensu* Tjeder, 1952).

Diagnostic characters : Wing venation : chrysoperla-type. Male abdomen : tergite 9 and ectoprocts dorsally fused above the anus; 8 and 9 sternites separated by an intersegmental membrane. Male genitalia : gonarcus with a pair of entoprocessus but without arcessus; pseudopennis lying in gonosaccus and situated below the gonarcus; gonosaccus paired.

Distribution : Palaearctic, Oriental (India) and Nearctic regions.

Remarks : A subgenus *Chrysopa* (s. str) was erected by Tjeder (1966). The species, *Chrysopa septempunctata* Wesmael recorded by Tjeder (loc. cit.) is known from India and the species was synonymised with *C. pallens* (Rambur) by Brooks and Barnard (1990). So, only two species is so far recorded under this genus.

Key to species of the genus ***Chrysopa***

Head with a black spot between antennae; face generally with seven black spots. .... *pallens* (Rambur)

Head without black spots between antenna and face without seven black spots. .... *virgestes* Banks

57. *Chrysopa pallens* (Rambur)

1841. *Chrysopa septempunctata* Wesmael, *Bull. Acad, Brux.*, **8** : 210.

1842. *Hemerobius pallens* Rambur, *Hist. nat. Ins. Neur.*, 425.

1842. *Hemerobius mauricianus* Rambur, *ibid.*, 425.

1850. *Chrysopa nobilis* Brauer, *Haidingers Naturw. Abh.*, **4** : 7.

1867. *Chrysopa cognata* MacLachlan, *J. Linn. Soc.*, **9** : 249.

1875. *Chrysopa centralis* MacLachlan, *Fedtschenkos, Reise in Turkestan*, 19.

1894. *Nothochrysa robusta* Gerstaecker, *Mitt. nat. Ver. Vorp. u. Rugen* **25** : 165.

1910. *Chrysopa ricciana* Navas, *Rev. russ. Ent.*, **10** : 193.

1923. *Cintameva septempunctata* Navas, *Entom. Catalunya Neuropt.*, p. 164.

1929. *Chrysopa septempunctata*, Killington, *Trans. ent. Soc. Hamps. and S. Eng.*, p. 32.

1966. *Chrysopa (Chrysopa) septempunctata*, Tjeder, *South African animal Life*, **12** : 352.

1990. *Chrysopa pallens*, Brooks and Barnard, *Bull. Br. Mus. nat. Hist. (Ent.)* **59**, no. 2 : 201.

Diagnostic characters : Head : with a black spot between antennae. Vertex : slightly raised. Face : normally with seven black spots - one between antennae, two crescentic spots just below antennae, a rounded spot on each gena and an elongate mark in either side of clypeus (though there is considerable variation in spotting). Forewing (Pl. 16, fig. 1) : oval, elongate, apex subacute, pterostigma long and narrow; im ovate and ending after first crossvein between Rs and M_{1+2}. several costal veinlets, centre of gradate crossveins, apical portion of Cu_2, 1A & 2A black. Hindwing : costal veinlets, crossveins between R_1 & Rs and centre of the gradates black. Male genitalia : gonarcus arcuate; pseudopennis arcuate; entoprocessus with dorsal horn; gonosaccus globular with long gonosetae; gonocristae at apex of sternite 9. Female genitalia : spermatheca with short vela; subgenital bilobed.

Material examined : 1 ex., India, West Bengal, Darjeeling, Rangiroom F.R.H., 10.xi.1975 (coll. J.K. Jonathan and party).

Distribution : India (West Bengal : Darjeeling; Himachal Pradesh). Elsewhere : Europe.

58. *Chrysopa virgestes* Banks

1911. *Chrysopa virgestes* Banks, *Proc. ent. Soc. Wash.*, **13** : 103.

1990. *Chrysopa virgestes*, Ghosh, *Rec. zool. Surv. India*, **86**(2) : 339.

Diagnostic characters : Female : Face : pale yellow. Vertex : with yellowish white dorsal vittata continuing over thorax and abdomen. Pronotum : slightly broader than long. Forewing : unmarked; a few costals, radials and medio-cubital crossveins dark; 4 inner and 5 outer gradates. Hindwing : 3-4 inner and 4-5 outer gradates. Female genitalia : tergite 9 + ectoproct, a rather elongate structure, subgenital weak, its distal lobes separated broadly by incision; spermatheca with triangular vella.

Material examined : 1 ex., (♀) : India, West Bengal, Darjeeling, Rangia rest House, 5.iv.1973 (coll. H.S. Sharma and party).

Distribution : India (West Bengal : Darjeeling; Bihar).

Remarks : It may be mentioned here that without examining the male genitalia it is not possible to change the generic status of the species. Therefore, the species *virgestes* is retained under the genus *Chrysopa.*

Genus 32. ***Cunctochrysa*** Holzel

1970. *Cunctochrysa* Holzel (as subgenus of *Anisochrysa* Nakahara) *Zeitschrift Arbeit. Oster. Entomol.*, **23** : *213.*

1990. *Cunctochrysa*, Brooks and Barnard, *Bull. Br. Mus. nat. Hist.* (Ent.), **59** (no. 2) : 213.

Type species : *Chrysopa albolineata* Killington

Diagnostic characters : Forewing : Sc & R widely separated; im narrow, ovate, occasionally rectangular; Rs sinuate; gradates in two parallel rows. Male genitalia : gonarcus long; entoprocessus long, tapering, ventrally curved; arcessus large, broad, axe-shaped with large ventral hook; gonosaccus short; without tignum and gonapsis. Female genitalia : subgenital bilobed apically with basal crumena.

Distribution : India (Sikkim). Elsewhere : Nepal; South Africa; Western Europe.

Remarks : The genus and the species is for the first time recorded from Sikkim which is dealt with.

59. ***Cunctochrysa albolineata*** (Killington)

1935. *Chrysopa albolineata* Killington, *J. soc. Br. Ent.*, **1**(3) : 87.

1990. *Cunctochrysa albolineata* Brooks & Barnard, *Bull, Br. Mus. nat. Hist.*, (Ent.), **59**(2) : 213.

Diagnostic characters : Head : green. Gena : with a black spot. Face : marked with black or red. Palpi : distinctly marked with black. Pronotum : with median yellow stripe. Wings : basal crossvein between Rs and M_{1+2} before apex of im in forewing (Pl. 18, fig. 3) : gradate crossveins in both wings blackish. Male genitalia : gonarcus long and narrow; arcessus large, axe-shaped in lateral view with large ventral hook and dorsal striations; entoprocessus long, tapering, ventrally curved; gonosetae long and numerous. Female genitalia : subgenital bilobed apically with basal crumena.

Material examined : 9 exs., (♂♀) : India, Sikkim, 5 mile camp on Nathula Road east, 25.vi.1989 (2 exs.); 5 kms. North-west of Lachen, 3500 m, 29.vii.1989 (1 ex.); Umthang, 3750 m, 9.vii.1989 (1 ex.) [coll. S.S. Saha and Party]; Arunachal Pradesh, Lower Subansiri, Itanagar, 17.x.1996 (2 exs.); Western Kameng, Rupa, 13.x.1996 (2 exs.) [coll. S.K. Mandal].

Distribution : India (Sikkim, W. Himalayas and Arunachal Pradesh). Elsewhere : Europe.

Remarks : The species is for the first time recorded from Sikkim and Arunachal Pradesh.

Genus 33. ***Retipennia*** Brooks

1986. *Retipennia* Brooks, *Neuroptera International,* **4** : 86.

Type species : *Chrysopa notata* Navas

Diagnostic characters : Vide key.

Distribution : India, South East Asia.

Remarks : Two species of *Retipennia* namely, *R. notata* (Navas) and *R. guttata* (Navas) were recorded from India of which *R. guttata* (Navas) was synonymised with *R. notata* (Brooks and Barnard, 1990). *R. notata* (Navas) is the most wide spread species. Following two species are hitherto reported from India.

Key to species of the genus ***Retipennia***

Forewing without tiny fuscous brown spot over first crossvein of inner gradate series and near base of dcc. ..... *notata* (Navas)

- With such spots. ..... *hasegawai* (Nakahara)

60. ***Retipennia notata*** (Navas)

1910. *Chrysopa notata* Navas, *Broteria,* **9** : 55.

1968. *Retipennia notata*, Brooks, *Neuroptera International.* **4** : 86.

Diagnostic features : Large lacewings with green ground colour. Labrum : emarginate. Legs : claws with basal dilatation. Forewing : broad, with brown suffusion on gradates; Sc and R widely separated; im small and ovate; gradates in two divergent series; Rs sinuate; C_1 shorter than C_2. Abdomen : long; setae long; callus cerci ovate; ectoproct with apical invagination; in male, sternite 8 + 9 fused; ventral apodeme with prominent apical tooth. Male genitalia : without tignum and gonapsis; median plate broad, bilobed; gonarcus elongate; entoprocessus long, slender; arcessus tapering apically with small apical tooth; membranous sac with many basally inclined microtrichia situated on dorsum of arcessus; without pseudopennis. Female genitalia : subgenital bilobed apically; spermatheca broad with small vela and short duct.

Material examined : 1 ex., (♀) : India, Mizoram, Champhai, 4.iv.1994 (coll. G.C. Sen and party).

Distribution : India : West Bengal (Darjeeling dt., Kurseong), Sikkim, Mizoram and Himachal Pradesh.

Remarks : The species is for the first time recorded from Mizoram.

61. ***Retipennia hasegawai*** (Nakahara)

1955. *Chrysopa hasegawai* Nakahara, *Kontyu,* **22** : 145.

1990. *Retipennia hasegawai* Brooks and Barnard, *Bull. Br. Mus. nat. Hist. (Ent.),* **59**, no. 2 : 265.

Diagnostic characters : Head, Pro-, meso-, metanotum and abdomen : pale yellow. Antenna : slightly brownish. Forewing (Pl. 18, fig. 1) : an elongated fuscous brown spot near middle of inner gradate series and veins within the spot being fuscous black; a very tiny fuscous brown spot over first crossvein of inner gradate series at the junction of the branch of Rs and M; a small fuscous brown spot near base of dcc and within this spot veins fuscous black. Hindwing : unmarked.

Material examined : 3 exs., (♂♀) : India, Meghalaya, Shillong, Botanical Garden, 1400 m. 19.iii.1991 (coll. S.K. Ghosh and party).

Distribution : India (Meghalaya). Elsewhere : Taiwan (Taihoku).

Remarks : The brown marking of forewing of the species is very conspicuous among its congeners. The species was for the first time recorded from India and also from the state of Meghalaya (*vide* Ghosh in press).

Genus 34. ***Semachrysa*** Brooks

1938. *Indochrysa* Banks, *Jour. Fed. Malay state Mus.,* **18** : 225.

1983. *Semachrysa* Brooks, *Bull. Br. Mus. nat. Hist.,* **47**(2) : 6.

Type species : *Semachrysa minuta* Brooks (Banks while describing *Indochrysa*, no type species was designated so Brooks (1983) while describing *Semachrysa minuta* designated the type-species).

Diagnostic characters : vide key.

Distribution : India, Sri Lanka, Southern China, Japan, Malaysia, the Philippines, Indonesia, Northern Australia to New Hebrides.

Remarks : There are three species of *Semachrysa* so far reported from N.E. India which are given below.

Key to species of the genus ***Semachrysa***

1. Forewing with dark brown spot at base of Rs but not at outer gradate series. .... *polysticta* Brooks

- Forewing without dark brown spot at base of Rs but with strong dark brown spot at base of outer gradate series. 2

2. Large dark brown spot present on fourth posterior marginal crossvein of forewing and small spot present on Cu_2; male genitalia with narrow arcessus but not ridged; female genitalia with duct of spermatheca twisted and very long. ..... *contorta* Brooks

- With small dark brown spot present on fourth posterior marginal crossvein of forewing; large brown spot on distal cubital cell of forewing; male genitalia with broad arcessus and ridged; female genitalia with duct of spermatheca and vela short. ..... *matsumurae* (Okamoto)

*62. ***Semachrysa polysticta*** Brooks

1983. *Semachrysa polysticta* Brooks, *Bull. Br. Mus. nat. Hist.* (Ent.), **47**(2) : 23.

Diagnostic features : Female : Head : with brown markings extending around lateral and dorsal edge of clypeus; brown mark on postocular lobe extending as band along edge of eye to anterior edge of vertex. Thorax : mesonotum with two small isolated brown spots and stripe on suture between mesoscutum and mesoprescutum. Forewing : dark brown spots at base of Rs, dcc and fourth posterior marginal crossveins; pale shading on some radial crossveins, gradates and Psm crossveins; without spot at base of inner gradate series. Female genitalia : spermathecal duct very twisted, vela long, ventral impression very deep.

Distribution : India (Meghalaya : Khasi Hills).

Remarks : Male of the species is unknown. The material is not available for study so the species has been reviewed from literature.

*63. ***Semachrysa contorta*** Brooks

1983. *Semachrysa contorta* Brooks, *Bull. Br. Mus. nat. Hist.* (Ent.), **47**(2) : 13.

Diagnostic features : Male. Frons : with large and triangular spot between antennae. Thorax : with brown spot on mesoscutum. Forewing : costa dark upto second costal crossvein; marked with brown spots at base of outer gradates, fourth posterior marginal crossvein, between branches of Cu_2. Male genitalia : arcessus narrow with basal bifurcation and lateral projections; gonarcus with prominent submedian tooth. Female : markings semilar to male. Female genitalia : spermatheca with vela long and curved, ventral impression very deep; subgenital plate narrow but basally wide.

Distribution : India (Meghalaya : Khasi Hills).

Remarks : Due to non-availability of material, the species has been reviewed from literature.

64. ***Semachrysa matsumurae*** (Okamoto)

1914. *Chrysopa matsumurae* Okamoto, *Jour. coll. Agric. Tohoku Imperial Univ., Japan,* **6** : 68.

1939. *Chrysopa decorata* Esben-Petersen, Banks, *Bull. Mus. Comp. Zool.,* **85** : 470 [misidentified by Banks].

1983. *Semachrysa matsumurae* Brooks, *Bull. Br. Mus. nat. Hist. (Ent.),* **47**(2) : 11.

Diagnostic features : Male. Head : with dark brown marking extending from gena along dorsal edge of clypeus. Thorax : broad, brown spot of mesonotum extending across mesoscutum and

mesoprescutum. Forewing : costa black upto third crossvein; brown spot on basal outer gradate series, at base of dcc; faint shadings on second and fourth posterior marginal crossveins, Psm cross veins, basal four radial crossveins. Male genitalia : gonarcus narrow; arcessus ovoid with dorsal grooves and basal bifurcation slight; entoprocessus rectangular. Female : markings as in male; female genitalia : spermathecal duct short, vela prominent and curved.

Material examined : 1 ex. (♂) : India, Meghalaya, Cherrapunji, 1250 m., 22.xi.1991 (coll. R.K. Varshney, I.G. Gupta and S.K. Ghosh).

Distribution : India (Meghalaya : Khasi Hills). Elsewhere : Taiwan; China; Japan.

Remarks : Though Khasi Hills was earlier included in the state of Assam but it is presently included under Meghalaya.

Subfamily b. APOCHRYSINAE

This subfamily includes only one genus which is dealt with here.

Genus 35. ***Joguina*** Navas

1912. *Joguina* Navas, *Broteria,* **10** : 98.

1990. *Joguina*, Brooks & Barnard, *Bull. Br. Mus. nat. Hist. (Ent.),* **59** (no. 2) : 138.

Type species : *Apochrysa nicobarica* Brauer

Diagnostic characters : Wings : more than two series of gradate crossveins; highly reticulated; radial area of forewing with atleast the basal half consisting of two or more rows of cells; costal area of forewing consisting of two or more rows of cells; accessory row of crossveins present in hind marginal area in apical half of both wings; basal Sc crossvein absent; im absent; Rs straight; Psm & Psc very close. Male genitalia : gonarcus narrow; arcessus broad, triangular with apical hook; without tignum, gonapsis, median plate, entoprocessus, pseudopennis, gonocristae. Female genitalia : subgenital bilobed; vella short; spermatheca broad.

Distribution : India (Assam). Elsewhere : Burma, Malaysia and Borneo.

Remarks : *J. nicobarica* was reported from Assam which is dealt with here.

*65. ***Joguina nicobarica*** (Brauer)

1864. *Apochrysa nicobarica* Brauer, *Verh. zool. bot. Ges. in wien.*,**14** : 896-902.

1912. *Joguina nicobarica* Navas, *Broteria,* **10** : 98.

Diagnostic characters : Forewing : broad, rounded apically, marked with dark shadings on pustules; pterostigma unmarked; Sc crossvein and im absent; gradates indistinct. C_1 and C_2 indistinct. Wing highly reticulated. Male genitalia : gonarcus very narrow; arcessus broadly triangular with apical hook. Female genitalia : spermatheca broad, vela short, duct narrow, long and highly coiled.

Distribution : India (Assam). Elsewhere : Malaysia and Burma.

Remarks : Brooks and Barnard (1990) described the genus *Joguina* in detail based on the Type species, *Apochrysa nicobarica* Brauer. On the basis of illustrations, diagnostic characters of the species have been noted as the material is not available for study.

Family H. MYRMELEONTIDAE

The family Myrmeleontidae owes its name to the Greek words murmex (= ant) and leontos (= lion) on the basis of the genus *Myrmeleon* proposed by Linnaeus (1767). Hence, Tillyard (1926) referred to the family name as Myrmeleontidae but not Myrmeleonidae which has been used by various workers in the field of Neuropterology. This taxon is the largest and most predominant of all its allies known from India and its members are popularly known as "ant lions", possibly from their familiar larval forms which live hidden in sand and debris or make conical pits in sands to snare their preys, namely, ants and other terrestrial insects and also to depredate on them.

Diagnostic characters : Body : generally long and slender except on Palparini and Acanthaclisini. Head (Pl. 1, fig. 1) : small with prominent lateral eyes but without ocelli. Antenna (Pl. 1, figs. 4-5) : longer than head, multisegmented, weakly clubbed or flattened towards apex. Mouthparts (Pl. 1, figs. 2-3, 7-8) : consisting of a pair of chitinised mandibles, a pair of maxillae with 5 segmented palpi, a labium with 3-segmented palpi. Wings (Pl. 2, figs. 1-2) : two pairs, usually subequal; cross veins numerous; with pterostigma; hypostigmatic cell long and subapical; costa with simple or forked veinlets; R and Sc fused apically; M with two branches and Cu forking twice, first into basal Cup and then into Cu_1 and Cu_2 in forewing; Rs arising near base; with 3 anal veins. Legs : slender or stout and tibiae generally with spurs. Abdomen (Pl. 3, fig. 2) : 10-segmented, male genitalia (Pl. 3, fig. 3) : with gonarcus and parameres; ectoproct appearing as a single large plate laterally.

REVIEW ON SYSTEMATIC POSITION

The family Myrmeleontidae, originally represented by a single genus, underwent a subsequent series of changes and recently a few subfamilies and quite a large number of tribes have been erected. Banks (1927), while revising the nearctic "Myrmeleonidae", recognised four subfamilies, viz., Dendroleoninae, Macronemurinae, Myrmeleoninae and Palparinae. Markl (1954) in his comprehensive World classification of the family eliminated the subfamily status and dealt only with the tribes. But Stange (1970) considered the subfamilies Dendroleontinae and Macronemurinae as synonyms of Myrmeleontinae and recognised three subfamilies, viz., Palparinae, Acanthaclisinae and "Myrmeleoninae" for the antlions from Western Hemisphere. Holzel (1972) proposed three subfamilies, viz., Palparinae, Echthromyrmicinae and "Myrmeleoninae" and lowered down Acanthaclisinae to the status of tribe. Presently, all the subfamilies *sensu* Holzel (loc. cit.) have been taken into account.

Key to the subfamilies of the family MYRMELEONTIDAE

1. Cup in forewing long, free and terminating at posterior margin of wing. .. Palparinae Banks
- Cup in forewing short. ..... Myrmeleontinae Banks

Subfamily a. PALPARINAE

This subfamily was erected by Banks (1899). It is hitherto known to be distributed in the Palaearctic, Ethiopian and Oriental regions of the globe and contains, *sensu* Markl (1954), three tribes, viz., Palparini, Palparidini and Pseudimarini. Of these, the first tribe is dealt with hereunder.

Tribe 1. PALPARINI

The tribe is readily recognised by the pronotum very much wider than long, wings highly punctate, the hind pair having crossveins connecting IA directly with 2A but not with the posterior margin of the wing and abdomen with long ectoproct. It has the widest range of distribution of all its allies, being known from Palaearctic, Ethiopian and Oriental regions of the globe. It is represented by three genera from the Indian subregion, of which only one is presently dealt with.

Genus 36. ***Palpares*** Rambur

1842. *Palpares* Rambur, *Hist. nat. Ins. Neuropt.*, p. 365.

1913. *Palpares*, Banks, *Ann. ent. Soc. Am.*, **6** : 171.

1972. *Palpares*, Holzel, *Beitr. naturk. Forsch. SudwDtl.*, **1** : 6.

Type species : *Myrmeleon libelluloides* Latreille

Diagnostic characters : Antenna : apart at base for a short distance lesser than the width of basal joint which is with long bristles. Pronotum : broader than long. Wings : heavily marked. Forewing : only one series of costal cells except near pterostigma; subcostal field without crossvein. Hindwing : not less than 4 crossveins before Rs; 1A connected with the postanal by a series of crossveins. Abdomen : tip in males with long elongated appendages.

Distribution : Western and Eastern Africa, Lebanon, Yemen, Iran, Afghanistan, Pakistan and India.

Remarks : The genus comprises of about 13 species from India, of which only 2 are presently dealt with.

Key to the species of the genus ***Palpares***

A large spot over Cu in hindwing; no projection of stigmal band towards tip of band on M in hindwing. ..... *pardus* Rambur

- Without spot over Cu in hindwing; stigmal band projecting towards tip of band M in hindwing. ..... *contrarius* (Walker)

66. ***Palpares pardus*** (Rambur)

1862. *Myrmeleon pardus* Rambur, *Hist. Nat. Ins. Neur.* : 375.

1868. *Palpares pardus* MacLachlan, *J. Linn. Soc.*, **9** : 275.

1984. *Palpares pardus*, Ghosh, *Rec. zool. Surv. India, Occ. Paper, no.* **52** : 12.

Diagnostic characters : Pronotum (Pl. 6, fig. 3) : with a median stripe and also a stripe on either side. Meso- and metanotum : with three interrupted black stripes. Forewing (Pl. C, fig. 1) : with several quadrate brown spots from base of costa towards apex; brown dots at base and along hind margin besides a few large brown spots on disc; an undulating brown band at tip. Hindwing (Pl. C, fig. 1) : with a few large brown spots on disc and small dots on hind margin; single pterostigmal band either extending outward or curved inward or broken into a series of spots; a large spot on Cu. Abdomen (Pl. 6, fig. 6) : apex in male with two long appendages and black bristles. Male genitalia : as Pl. 6, figs. 4-5.

Material examined : 1 ex. (♀), India, West Bengal, Darjeeling district, Siliguri, Deshbandhu Para, 3.x.1996 (coll. S.K. Ghosh).

Distribution : India (Sikkim; West Bengal; Bihar; Orissa; Madhya Pradesh; Maharashtra; South India).

Remarks : Author has encountered the species from North-East India and he has also studied the species from different states of India. However, the species is common and occuring in both Himalayan and Peninsular sectors of India.

67. ***Palpares contrarius*** (Walker)

1853. *Myrmeleon contrarius* Walker, *Cat. Brit. Mus. Neur.*, **2** : 101.

1868. *Palpares contrarius* MacLachlan, *J. Linn. Soc.*, **9** : 274.

1984. *Palpares contrarius*, Ghosh, *Rec. zool. Surv. India, Occ. Paper no.* **52** : 11.

Diagnostic characters : Large species with wing length more than 50 mm. Antenna : black. Vertex : with two black bands and a black spot behind hind band. Thorax (Pl. 6, fig. 1) : with three black stripes. Wings : slightly undulating along hind border; pterostigma indistinct. Forewing : dotted with brown; tinged with pale brown specially at tip; 4 oblique dark brown bands on disc, first interrupted at middle but with a spot between it and base, second extending to hind border, third shorter, fourth interrupted at middle. Hindwing : with three dark brown bands - median band reaching fore- and hind border, stigmal band extending to hind border with a projection towards tip of median band, apical band broader at hind border; an oblique blackish streak on hind border along postcosta and branch of Cu. Legs. : pitchy; spurs of hind tibiae as long as three joints of tarsi. Abdomen (Pl. 6, fig. 2) : darker towards apex.

Material examined : 1 ex., (♂) : India, Mizoram, dist. Chimtuipul, Saiha, 8.iv.1994 (coll. S.K. Ghosh and M. Prashad).

Distribution : India (Mizoram; Uttar Pradesh; Karnataka; Maharashtra; Orissa). Elsewhere : Sri Lanka.

Remarks : This beautiful species is for the first time recorded from Mizoram of N.E. India.

Subfamily b. MYRMELEONTINAE

Banks (1899) erected this subfamily along with the other i.e. Dendroleoninae, on the basis of a number of crossveins present before Rs. But later, it was found by several workers that the aforesaid character has a limited value for the separation of these two subfamilies. Hence, Stange (1970) and Holzel (1972) considered both the subfamilies in Myrmeleontinae which comprises 18 tribes *sensu* Markl (1954) and is so far reported from all the zoo-geographical regions of the world. Regarding the tribal classification, Holzel (loc. cit.) has been basically followed, after whom only 6 tribes are dealt with and keyed.

Key to the tribes of the subfamily MYRMELEONTINAE

1. In forewing, Rs arising near base; male with axillary plate; hindwing atmost with two radial cross veins. ..... Dendroleontini Navas
- In forewing, Rs not arising near base, but almost at bifurcation of Cu. 2
2. Inner radial field of hindwing with 3 or more crossveins. 3
- Inner radial field of hindwing with only 1 crossvein. 4
3. In hindwings, 1A fused with the lower branch of Cu; spur of hindtibia bent at right angle and never shorter than 3 tarsal segments taken together; male with axillary plate; stout and hairy body. ..... Acanthaclisini Navas
- In hindwing, 1A not fused with Cu; spur of hindtibia not bent at right angle and shorter than above; not stout and hairy. ..... Myrmeleontini
4. In forewing, 2A and 3A short, fused; 2A simple, 3A forked; wings generally with recognisable banksian line. ..... Distoleontini Banks
- In forewings, 2A and 3A uniting at a distance and fused; 2A forked, 3A simple; wings always without banksian line. ..... Glenurini Banks

Tribe i. DENDROLEONTINI

The tribe is reported to exihibit cosmopolitan distribution in the globe excepting for New Zealand. It is represented by 5 genera from India of which 4 are dealt with.

Key to genera of the tribe DENDROLEONTINI

1. Wing with some costals crossed beyond middle; legs not very slender. ..... *Layahima* Navas
- Wing without crossed costals (or only one or two); legs more slender. 2

2. Outer margin of forewing concave before tip. ..... *Indoclystus* Banks

- Outer margin of forewing not plainly concave before tip. 3

3. In both wings, M and Cu plainly convex in front beyond cubital fork; some large spots on wings. ..... *Dendrolen* Brauer

- In both wings, M and Cu running straight beyond cubital fork; without large spots on wings. ..... *Gatzara* Navas

Genus 37. ***Layahima*** Navas

1912. *Layahima* Navas, *Broteria,* **10** : 36.

1984. *Layahima*, Ghosh, *Rec. zool. Surv. India, Occ. Paper, no.* **52** : 34.

Type species : *L. nebulosa* Navas

Diagnostic characters : Forewing : some costals crossed beyond middle of wing; anal area distinctly little broader than at middle; only a few anal branches connected by crossveins. Hindwing : Rs arising a little before cubital fork; not more than 2 crossveins before Rs; cubitus straight to forking. Legs : not very slender; basal tarsal joint elongate; hind spurs not twice as long as claws.

Distribution : India and China.

Remarks : The genus is represented by only a single Indian species which is dealt with.

*68. ***Layahima nebulosa*** Navas

1912. *Layahima nebulosa* Navas, *Broteria,* **10** : 36.

1976. *Layahima nebulosa*, Stange, *Acta. Zool. Lilloana,* **31** : 310.

1984. *Layahima nebulosa*, Ghosh, *Rec. zool. Surv. India, Occ. Paper, no.* **52** : 34.

Description (After Navas, 1912) : "Staminea, fusco, variegata. Caput clypeo, labro, palpisque testaceis, palpis labialibus ultimo articulo fusiformi, acuto, externi vix infuscato; fronte arte antennis fascia transversa lata, medio in clypeum producta, linea ad clypii latera, nigris; vertice subtoto nigro; antennis validis, fuscis, singulis segmentis apice strameneis, clava obscuriore, seu angustius straminco annulata, inferne rufescente, tertiam partem longitudinis antennae aequante.

Thorax totus stramineo et fusco maculatus, superne obscurior, interne pallidiore. Abdomen ala posterior multobrevius, crassum, straminium, fusco punctatissimum, dorso singulis segments base et apice late fuscis, inferne multo pallidus. Pedes teretes, straminei, fusco punctati, femoribus anterioribus apice tantum fuscis; tibiis prope basim et apice fusco annulatis; tarsis articulis parum fuscatis, ultimo rufescente; unguilibus testaceis, parum arcuatis, ultimo tarsorum articulo multo brevioribus.

Alae amplae, basi angustae, apice parabolice rotundatae margine externo prope apicem concavo,

veins fuscis, pallido variegatis; costa pallida; stigmata grandi, rotundato, albido, interne ad unionem subcostae et radii fusco; venulis albis, fuscis mistis; membrane hyalina, prope aliquot venulas fusco leveter tincta in maculas nebulosus.

Ala anterior striis in area subcostali venulas imitatantibus; venulis aliquot fusco liviter limbatis, maculas tenues efficientibus 6-8 praeter radium et inter cubitus, aliis in disco subevanidis, alia visibili ante marginem, duabus obscurioribus grandioribusque, quarum altera inter cubitos ubi curvantur ante apicem, altera ad anastomosim rami obliqui cubiti; praeterea furculis marginalibus ad axillas limbatis. Ala posterior angustior, multo minus maculata, macula visibili inter cubito ad arcum, alia tenuiore in disco ante marginem externum; axillis furcularum marginalium obscuratis.

Long. Corp	22.5 mm.
- abd.	14.5 mm.
- al. ant.	32.5 mm.
- al. post.	30.8 mm.
Latit. ant.	11 mm".

Distribution : India (West Bengal : Darjeeling).

Remarks : Banks (1941) while describing *Layahima chiangi* from China has considered *nebulosa* as a good species. As the author has not got the material for study, the original description of Navas (1912a) is included for the revisionary work in future.

Genus 38. ***Indoclystus*** Banks

1941. *Indoclystus* Banks, *Am. Mus. Novit.*, **1143** : 3.

1977. *Indoclystus,* Ghosh & Sen, *Rec. zool. Surv. India,* **72** : 303.

Type species : *Glenurus singularis* Westwood

Diagnostic characters : Forewing : no costals crossed; large dark spots near wing tip; crossveins in apical area; cubital fork nearly at right angle to cubitus; hind margin beyond anal vein convex but concave before tip; only a few anal branches connected by crossveins. Hindwing : Rs arising a little before cubital fork; not more than two crossveins before Rs. Legs : very slender.

Distribution : India.

Remarks : Onle a single species has hitherto been reported from India which is dealt with hereunder.

69. ***Indoclystus singularis*** (Westwood)

1848. *Myrmeleon singularis* Westwood, *Cabinet Oriental ent.*, p. 70, pl. 34.

1853. *Myrmeleon singularis*, Walker, *Cat. Brit. Mus. Neur.*, **2** : 399.

1868. *Glenurus singularis* MacLachlan, *J. Linn. Soc. Zool.*, **9** : 281.

1941. *Indoclystus singularis* Banks, *Am. Mus. Novit.*, New York, no. **1143** : 3.

1977. *Indoclystus singularis*, Ghosh & Sen, *Rec. zool. Surv. India,* **72** : 303.

Redescription : Head (Pl. 8, fig. 1) : yellow with black markings. Frons : black. Clypeus : brownish with a dark brown spot on either side. Labrum : dark brown. Maxillary and labial palpi : yellow. Antenna : scape and pedicel blackish brown; flagellar segments yellow but several segments beyond pedicel blackish brown at base but yellow at apex. Pronotum (Pl. 8, fig. 1) : yellow with a narrow black stripe at middle; black hairs well-marked at lateral margins. Meso- and metanotum : yellow with a black patch on prescutum of mesothorax; a broad median black stripe extending from mesoscutum to metascutellum. Wings : hyaline with spots; longitudinal veins pale yellow with dark brown bands; costal crossveins wholly or partially dark brown. Forewing : 5 brown spaces between Sc and R; two brown spots between R and Rs beyond hypostigmatic cell; a brown cloud at middle between c and Sc; a brown spot before indistinct pterostigma; apex beyond pterostigma brown which is extending from apex towards base along hind margin and continuing little beyond apical part of M and Cu_1; a round brown spot between M and Cu_1 near apex; an irregular brown spot extending from cubital fork to hind margin; a brown spot at middle of 1A; brown cloud at the junction of R and Rs, M_1 & M_2, Cu_1 and Cu_2 and on eight crossveins between R & Rs and between first and second branch of Rs. Hindwing : apical brown spot extending along hind margin upto the terminal portion of fourth branches of Rs and beyond it three round spots and one irregular spot at apex of Cu_1 and M_1; brown bands in the longitudinal veins indistinct; other spots in forewings lacking. Legs : yellow; femora and tibiae dark brown at middle and tips black; spurs at hind tibiae red and equal to two tarsal segments taken together; each tarsal segment dark brown at apex; claws red; hairs black. Abdomen (Pl. 8, fig. 2) : yellow with some brown patches either at apex or base of each segment. Male genitalia (Pl. 8, fig. 3) : mediuncus small, brownish; parameres black, apical part broad and lower part pointed; gonarcus arch-shaped and without entoprocessus.

Measurement : Length of forewing : 36 mm; hindwing : 34 mm.

Material examined : 1 ex., (♂) : India, Sikkim, Tumin, alt. 1800 m., East district, 29.ix.1988 (coll. V.C. Agarwal).

Distribution : India (North India : Sikkim).

Remarks : The species is for the first time recorded from Sikkim.

Genus 39. ***Dendroleon*** Brauer

1866. *Dendroleon* Brauer, *Reise Freg. novara, zool Theil.*, **2** : 42.

1912. *Neglurus* Navas, *Mem. R. Acad. Cienc. Artes, Barcelona,* **10**(9) : 171.

1914. *Borbon* Navas, *Ibid.*, **11** : 112.

1914. *Mossega* Navas, *Ann. Soc. Sci. Brux.*, **38** : 248.

1915. *Madagascaroleon* Fraser, *Mem. Inst. Sct. Madagascar,* **5** : 232.

1976. *Dendroleon*, Stange, *Acta zool. Lilloana* **31** : 292.

Type species : *Myrmeleon pantherinus* Fabricius

Diagnostic characters : Antenna : long. Pronotum : longer than broad. Wings : with large spots; with a single costal series; banksian line complete in both. Forewing : Rs arising before cubital fork; 2A running free of both 1A and 3A and also connected to each by one or more crossveins; without inter-cubital line. Legs : very slender; tibia about as long as femur; basitarsus as long as 5th tarsal segment; spurs of hind tibia long, equal to two tarsal segments taken together.

Distribution : India, China, Europe, Anatolia.

Remarks : Stange (1976) included *Borbon regius* Navas under the genus *Dendroleon*. Therefore, the distribution of the Genus has been extended to India.

*70. ***Dendroleon regius*** (Navas)

1914. *Borbon regius* Navas, *Mem. R. Acad. Cienc. Artes barcelona,* **11** : 112.

1976. *Dendroleon regius*, Stange, *Acta zool. Lilioana,* **31** : 295.

Distribution : India.

Remarks : Stange (1976) referred to as *Dendroleon regius* based on the study of Holotype (♀) from "Sikkim, Darjeeling, ex. coll. 4. Frushstorfer." In this connection it may be stated that the specimen may be collected either from Sikkim or from Darjeeling. Because these two places belong to two states, namely, Sikkim and West Bengal. Therefore this needs correction. Both the material and literature is not available for study therefore the author reserves his comment on the species.

Genus 40. ***Gatzara*** Navas

1915. *Gatzara* Navas, *Mem. R. Acad. Cience. Artes, Barcelona,* **11** : 375.

1976. *Gatzara*, Stange, *Acta Zool. Lilloana,* **31** : 298.

1984. *Gatzara*, Ghosh, *Rec. zool. Surv. India, Occ. Paper No.* **52** : 33.

Type species : *Gatzara jubilaea* Navas

Diagnostic character : Antenna : wide apart from its counterpart at base. Pronotum : broader than long. Wing : membranous, wavy at apex with the anterior banksian line well represented; posterior banksian line indistinct; apical area with one entire or broken alternate series of gradate crossveins : costal veinlets mostly simple; apical and posterior margin convex; Cu_2 and 1A confluent with curved apex; a number of radial crossveins in forepair and only one in hindpair. Legs : with tibia longer than the femur; 1st tarsal segment shorter than 5th which is equal to three preceeding subequal ones taken together; hind femur without sensory hair. Female genitalia : gonapophysis anterioris larger than the gonapophysis posterioris.

Distribution : The genus is so far recorded from India in the Oriental region.

Remarks : The genus comprises two Indian species, of which only one is dealt with hereunder as it is represented in North-East India.

71. *Gatzara jubilaea* Navas

1915. *Gatzara jubilaea* Navas, *Mem. R. Acad. Cienc. Artes, Barcelona,* **11** : 34.

1984. *Gatzara jubilaea*, Ghosh, *Rec. zool. Surv. India, Occ. Paper, no.* **52** : 34.

Diagnostic characters : Frons : with brown markings. Pronotum : with fuscus longitudinal median line, lateral lines and margin also fuscus. Wings (Pl. D, fig. 2) : elongate, apex acute; pterostigma white; Rs with 11 branches. Forewing : with 4 crossveins in radial area before Rs; all veins with fuscus markings specially in apical, radial and cubital area and at hind margin; two oblique striations : one at rhegma and other at forked branch of Cu. Abdomen : fuscus.

Material examined : 3 exs. (♀♀) : India, West Bengal, Darjeeling, 15.vii.1978 (coll. R.K. Jana); Birch hill, alt. 2123 m. 21.vii.1978 (coll. A.K. Gupta); Rajbari, 15.v.1979 (coll. N. Pradhan); 1 ex., Sikkim, Jorethans, 11.iv.1994 (coll. P.H. Roy and party).

Distribution : India (West Bengal and Sikkim).

Remarks : The species is for the first time recorded from Sikkim.

Tribe ii. ACANTHACLISINI

The tribe is known almost throughout the continental and insular areas of the globe. *Acanthaclisis* Rambur, *Syngenes* Kolbe and *Centroclisis* Navas, *Stiphroneura* Gerstaecker have so far been reported from India. Amonst 4 Indian species hitherto known under the genus *Acanthaclisis* Rambur, the species *horridus* (Walker) has, however, been transferred to *Centroclisis* Navas. Only two genera are presently dealt with.

Key to genera of the tribe *Acanthaclisini*

In forewing, a single series of costal cells before pterostigma..... *Centroclisis* Navas

\- In forewing, two series of costal cells before pterostigma..... *Stiphroneura* Gerstaecker

Genus 41. *Centroclisis* Navas

1909. *Centroclisis* Navas, *Bull. Inst. Catalana Hist. nat.*, **6** : 71.

1911. *Neboda* Navas, *Rev. Russe. ent.*, **11** : 114.

1912. *Sogra* Navas, *Broteria,* **10** : 43.

1914. *Neoclisis* Navas, *Ann. Mus. Civ.*, **46** : 205.

1932. *Stenoclisis* Navas, *Broteria Ci. nat.*, **1** : 62.

1954. *Centroclisis*, Markl. *Verh. naturf. Ges. Basel,* **65** (no. 2) : 231.

1972. *Centroclisis*, Holzel, *Beitr. naturk. forsch. SudwDtl.*, **1** : 13.

1984. *Centroclisis*, Ghosh, *Rec. zool. Surv. India, Occ. Paper no.* **52** : 35.

Type species : *Acanthaclisis cervina* Gerstaecker

Diagnostic characters : Body : very hairy. Prothorax; broader than long. Forewing : costal area narrow; crossveins mostly simple; costal field with one row of cells; crossveins forked and veinlets sometimes anastomosed a little before pterostigma; Cu_2 straight and reaching hind margin; M somewhat curved apically and first out of atleast 4 branches of Rs forked near base; banksian lines distinct. Hindwing : 4 or more crossveins before Rs; Cu_2 and 1A coalescing; posterior banksian line indistinct at its base; Legs : short and stout; with spurs much curved.

Distribution : Africa and India.

Remarks : Out of a total of four species from India only one species of the genus is dealt with here.

72. ***Centroclisis horridus*** (Walker)

1853. *Myrmeleon horridus* Walker, *Cat. Brit. Mus. Neur.*, **2** : 336.

1868. *Acanthaclisis horridus* MacLachlan, *J. Linn. Soc.*, **9** : 276.

1984. *Centroclisis horridus* Ghosh, *Rec. zool. Surv. India, Occ. Paper*, no. **52** : 36.

Diagnostic characters : Face : pale. Antenna, head and thorax (Pl. 4, fig. 3) : black. Wings : broader than other related species known from India. Forewing : costa simple; pterostigma white with a black mark on either side; Rs at origin, and a few crossveins between R & Rs with smoky brown patches; black mark near tip of M, Cu_1 and Cu_2; some smoky brown patches near tip of wing and on few branches of Rs; 10 crossveins before Rs; some costals forked. Hindwing : shorter and narrower than forewing; brown dot on either side of pterostigma; a brown mark near tip of Cu_1 & M, besides a smoky brown shade from tip of Cu_1 & M extending upto hind margin; 5 crossveins before Rs. Abdomen (Pl. 4, fig. 4) : black.

Material examined : 4 exs. (♂♀) : India, Assam, Sibsagar, no other data.

Distribution : India (Assam, West Bengal, Bihar, Orissa, Tamil Nadu).

Genus 42. ***Stiphroneura*** Gerstaecker

1885. *Stiphroneura* Gerstaecker, *Mitt. naturw. Ver. Neu. Vorpom. u. Rugen*, **16** : 91.

Type species : *Myrmeleon inclusus* Walker

Diagnostic characters : Antenna : long and wide apart from its counterpart at base. Forewing : crossveins before origin of Rs crossed; with three anal veins, of which 2A and 3A being united. Hindwing : with a double series of costal cells; 3 or more cross veins before Rs; 1A connected with the margin by crossveins. Legs : very stout and hairy : spur of hind tibia longer than basal joint of tarsus and much curved. Abdomen : ectoproct moderately long.

Distribution : India and "East Indies".

Remarks : Only one species is known from India and dealt with below.

73. ***Stiphroneura inclusa*** (Walker)

1853. *Myrmeleon inclusus* Walker, *Cat. Brit. Mus. Neur.*, **2** : 327.

1886. *Stiphroneura inclusus* Gerstaecker, *Mitt. naturw. var. neu. Vorpom. u. Rugen.*, **16** : 91.

1909. *Stiphroneura inclusa*, Needham, *Rec. Indian Mus.*, **3** : 200.

1984. *Stiphroneura inclusa*, Ghosh, *Rec. zool. Surv. India, Occ. Paper, no.* **52** : 26.

Diagnostic characters : Body : stout, dark ferrugineous. Antenna : black. Head : pitchy. Pronotum : with greyish marks. Legs : black and stout; spurs curved. Wings : greyish, pterostigma whitish; costal veinlets divided by transverse veinlets from base to pterostigma. Forewing : with numerous limpid spots along borders and also at apex; limpid spots alternately arranged with some pale brown spots; a few dark brown spots at base, at apex, one between the apical portion of first sector of radius and cubitus. Hindwing : with some alternate pale brown and limpid spots along borders towards tip; two large brown nearly rounded spots - one near foreborder and other near hind border. Abdomen : less than half the length of wings; slightly paler than thorax.

Material examined : 4 exs. (♂♀) : India, Sikkim, no other data. 1 ex. (damaged) : Meghalaya, East Garo Hills, Rongrengiri, 12.x.1982 (coll. J.R.B. Alfred).

Distribution : India (Sikkim; Meghalaya; Orissa; Himachal Pradesh). Elsewhere : East Indies.

Remarks : Ghosh (in press) recorded the species from Meghalaya.

Tribe iii. MYRMELEONTINI

The tribe, erected by Banks (1911b), is cosmopolitan in distribution excepting for the British isles. Presently, only 5 genera are known from the Indian subregion, of which three are dealt with hereunder.

Key to the genera of the tribe ***Myrmeleontini***

1. In forewing, Rs arising before cubital fork. 2
- In forewing, Rs arising much beyond cubital fork. ..... *Myrmeleon* Linn.
2. In forewing, costal veinlets connected by crossveins before pterostigma; without banksian line. ..... *Hagenomyia* Banks
- Costal veinlets not connected by crossveins before pterostigma; with posterior banksian line. ..... *Talosus* Navas

Genus 43. ***Myrmeleon*** Linnaeus

1867. *Myrmeleon* Linnaeus, *Syst. Nat., Ed.* **12** : 913.

Type species : *Myrmeleon formicarius* Linn.

Diagnostic Characters : Antenna : short, clubbed, widely separated from its counterpart at

base and generally shorter than head and thorax taken together. Wings : a single series of costal cells; costal veins simple; Rs originating beyond cubital fork. Forewing : Cup running parallel to 1A for a short distance and connected with Cu by a crossvein; 2A running close to 1A, bending towards posterior margin and then uniting shortly with 3A for a distance. Hindwing : anterior banksian line indistinct or absent; intercubital line distinct; apical field with some crossveins. Legs : short, 5th tarsal joint distinctly longer than first; spur of hind tibia nearly equal to first tarsal joint. Abdomen : not longer in male than in female; the last segment very short in both sexes and the penultimate segment of male shorter than that of female; genitalia in male with gonarcus, parameres and mediuncus.

Distribution : Cosmopolitan.

Remarks : Amongst a total of 18 species so far known from India, four are dealt with here.

Key to the species of the genus ***Myrmeleon***

1. Pronotum without longitudinal stripe. ..... *clothilde* Banks
- Pronotum with single or more longitudinal stripes or line. 2
2. Pronotum with a single, brown longitudinal line or stripe. ..... *montanus* Navas
- Pronotum with more than one stripes. 3
3. Pronotum with two broad longitudinal dark stripes. ..... *assamensis* Ghosh
- Pronotum with three longitudinal dark stripes. ..... *berenice* Banks

74. ***Myrmeleon clothilde*** Banks

1913. *Myrmeleon clothilde* Banks, *Trans. Amer. ent. Soc.*, **39** : 223.

1984. *Myrmeleon clothilde*, Ghosh, *Rec. zool. Surv. India, Occ. Paper, no.* **52** : 22.

Diagnostic characters : Frons, genae, clypeus, labrum, maxillary palpus : yellow. Mandible : brown. Antenna : black; large inter-antennal black mark covering vertex. Vertex : black with yellowish antero-lateral corners. Meso- and metanotum : black. Forewing (Pl. D, fig. 3) : all veins and crossveins yellow with brown bands; 7 crossveins before Rs. Hindwing (Pl. D, fig. 3) : 5 crossveins before Rs. Legs : femora yellow with black apices; fore- and mid tibiae black with a few yellow patches; hind tibiae yellow with inner sides and apices black. Abdomen : black.

Material examined : 2 exs. (1 ♀, 1 damaged) : India, West Bengal, Darjeeling, Churanti Hill, 12.iii.1974 (coll. H.K. Bhowmick and party).

Distribution : India (West Bengal : Darjeeling).

Remarks : Ghosh (in press) recorded the species from West Bengal.

75. *Myrmeleon montanus* Navas

1914. *Myrmeleon montanus* Navas, *Ann. Soc. Sci.*, **38** : 234.

1984. *Myrmeleon montanus*, Ghosh, *Rec. zool. Surv. India, Occ. Paper, no.* **52** : 24.

Diagnositc characters : Head and frons : black and shining; Labrum and palpi : brown. Vertex and occiput : black. Pronotum : broader than long; with a brownish median line; lateral margins brownish. Wings : hyaline; venation brown; pterostigma white. Forewing : 7 crossveins before Rs; apical area with two series of gradate crossveins. Hindwing : with 5 cross veins before Rs. Abdomen : brown.

Material examined : 5 exs. (♂ ♀) : India, West Bengal, Darjeeling, Rajbari, 12.vi.1979 (coll. N. Pradhan); Darjeeling, 1.viii.1979 (coll. nil); Sikkim, Gangtok, 21.ix.1996 (coll. S.K. Ghosh); Arunachal Pradesh, Jegong, Rupa, 13.x.1996 (coll. S.K. Mandal).

Distribution : India (West Bengal : Darjeeling; Sikkim; Arunachal Pradesh; Himachal Pradesh).

Remarks : The species is generally found in hilly region of North-East India and Himachal Pradesh. It is for the first time recorded from Sikkim and Arunachal Pradesh.

76. *Myrmeleon assamensis* Ghosh

1984. *Myrmeleon assamensis* Ghosh *Rec. zool. Surv. India, Occ. Paper,* no. **52** : 23.

Diagnostic characters : Clypeus and labrum : brownish. Maxillary palpus : yellow to fuscus. Frons : shiny black. Vertex : black with two longitudinal spots at middle and one transverse black spot on either side. Antenna : black. Pronotum (Pl. 7, fig. 3) : yellow with two broad longitudinal black stripes. Meso- and metanotum : black with yellow borders. Wings : veins mainly pale yellow but costal crossveins and crossveins ending at hindmargin black; pterostigma indistinct. Forewing : 8 crossveins before Rs. Hindwing : with 4 crossveins before Rs. Legs : brown but hind femur black at apex. Abdomen : black with tip yellow from 5th tergites to apex. Male genitalia : as in Pl. 7, figs. 4-5.

Material examined : 4 exs. (♂ ♀) : India : Assam, Raimona, 14.vi.1973 (coll. S.S. Saha and party); 1 ex. (♀), Mizoram, Vairengte, 4.xi.1996 (coll. S.K. Mitra).

Distribution : India (Assam and Mizoram).

Remarks : The female of the species is for the first time recorded from Mizoram.

77. *Myrmeleon berenice* Banks

1913. *Myrmeleon berenice* Banks, *Trans. Amer. ent. Soc.*, **39** : 222.

Diagnostic characters : Face : yellowish. Interantennal mark black. Vertex : with two transverse rows of three dark spots; middle one of front row double. Pronotum : broader than long, pale with three dark stripes. Meso- and Metanotum : dark. Wings : hyaline; slender and acute at apex;

subcosta with dark spaces; pterostigma pale. Forewing : Rs arising beyond end of anal vein. 12 crossveins before Rs. Hindwing : 8 crossveins before Rs.

Material examined : 1 ex. : India, Assam, Sibsagar, no other data.

Distribution : India (Assam). Elsewhere : Sri Lanka.

Genus 44. ***Hagenomyia*** Banks

1911. *Nelees* Navas, *Rev. zool. bot. afric.*, **1** : 244.

1911. *Hagenomya* Banks, *Ann. ent. Soc. Am.*, **4** : 8.

1912. *Balaga* Navas, *Rev. Russe. Ent.*, **12** : 111.

1912. *Baliga* Navas, *ibid.* : 110.

1962. *Hagenomyia*, Kuwayama, *Pacif. insects*, **4** (no. 2) : 387.

Type species : *Myrmeleon tristis* Hagen

Diagnostic characters : Antenna : wide apart from its counterpart at base. Wings : broad at pterostigma. Forewing : Rs arising at the same level of cubital fork; several costal veinlets before pterostigma connected by a row of crossveins; no line through the apical part. Hindwing : several crossveins before Rs. Legs : spur of hind tibia not longer than its tarsal segment.

Distribution : Africa, China, India, Korea, Japan and Australia.

Remarks : Markl (1954) synonymized the genus *Baliga* Navas, with the genus *Hagenomyia* Banks. So, *Baliga monticola* Navas, may be considered under the genus *Hagenomyia* Banks. Moreover, Esben-Petersen (1913) considered *Myrmeleon sagax* Walker as *Hagenomyia sagax* (Walker). The author has considered the species *eurystictus*, *nigrinus* and *marginicollis* under *Hagenomyia* as new combination.

Key to the species of the genus ***Hagenomyia***

1. Pronotum with more than one uninterrupted stripes. 2
- Pronotum either without or with one or more interrupted stripes. 3
2. Vertex with two yellow spots; pronotum with three yellow uninterrupted stripes. ..... *sagax* (Walker)
- Vertex with two rows of black spots; pronotum with three black stripes. ..... *marginicollis* (Gerst.)
3. Vertex black and rugose. 4
- Vertex black but not rugose. 5
4. Wings with large, irregular, milk-white pterostigma reaching costal margin; pronotum without any median stripe. ..... *eurystictus* Gerstaecker

- Wings with small, oval pterostigma not reaching costal margin; pronotum with interrupted yellowish median streak. ..... *nigrinus* (Esben-Petersen)

5. Pronotum with a single, median, longitudinal ferrugineous stripe. ..... *monticolla* (Navas)

- Pronotum with a narrow, median longitudinal black stripe on upper half and a broad stripe on either side of it . ..... *jamduarensis* Ghosh

78. ***Hagenomyia sagax*** (Walker)

1853. *Myrmeleon sagax* Walker, *Cat, Brit. Mus. Neur.*, **2** : 382.

1912. *Balaga nitens* Navas, *Rev. Russe. Ent.*, **12** : 111.

1913. *Hagenomyia sagax*, Esben-Petersen, *Ent. Mit.*, **2** : 223.

1971. *Hagenomyia sagax*, Nakahara, *Kontyu*, **39**(1) : 61.

Diagnostic characters : Frons : yellow. Vertex : with two yellow spots. Pronotum : with three yellow stripes. Meso- and metanotum with yellow borders. Wings (Pl. C, fig. 2) : long and narrow; subacute at apex; pterostigma white; veins black; Sc and R yellow. Forewing : costa with forked veins which are divided by transverse veinlets for some distance from pterostigma towards base. Hindwing : narrower than forewing and pterostigma smaller than forewing. Legs : testaceous. Abdomen : ventrally yellow.

Material examined : 5 exs. (♂♀) : India, West Bengal, Darjeeling, Possak, 3500 ft., vi.1916 (coll. L.C. Harris); Kurseong, no other data; Sikkim, Singla, vi.1912 (coll. nil); Gangtok, 21.ix.1996 (coll. S.K. Ghosh); Assam. Manas Sanctuary, Mothorguri, Kamrup, 13.iii.1967 (coll. S. S. Saha and party).

Distribution : India (West Bengal : Darjeeling; Sikkim; Assam; Western Himalayas). Elsewhere : Taiwan; Bangladesh (Sylhet).

Remarks : Nakahara (1971) corroborated the opinion of Esben-Petersen (1913) and placed the species *sagax* under the genus *Hagenomyia* though Navas objected to this view and wanted to retain the species under *Myrmeleon*. However, the species is for the first time recorded from Sikkim and Assam.

79. ***Hagenomyia marginicollis*** (Gerstaecker) Comb.nov.

1893. *Myrmeleon marginicollis* Gerstaecker, *Mitt. Naturw. Ver. Neu-Vorpomm. u. Rugen*, **25** : 143.

1923. *Myrmeleon marginicollis*, Needham, *Rec. Indian Mus.*, **3** : 200.

1977. *Myrmeleon marginicollis*, Ghosh & Sen, *Rec. zool. Surv. India*, **72** : 311.

Diagnostic characters : Vertex : with two rows of black spots. Space between antennae black which is continued laterally below antennae upto inner edges of eyes. Frons : yellow but dark brown on either side and at apex. Clypeus and labrum : brownish yellow. Pronotum : yellow with three black stripes. Forewing (Pl. 9, figs. 2-3) : costals crossed before yellow pterostigma; Rs arising at the level of cubital fork; 9-10 crossveins before Rs; venation brownish. Hindwing :

narrower than forewing and apex more acute. Legs : brown; spur of hind tibia equal to first tarsal segment. Abdomen : dark brown.

Material examined : 2 exs. (tip of abdomen missing) : India, Manas Sanctuary. Assam, Dt. Kamrup, 13.xi.1975 (coll. S.S. Saha).

Distribution : India (Assam; Western Himalaya : Kulu).

Remarks : The species is for the first time recorded from Assam. This is being placed in the genus *Hagenomyia* because the costals are crossed before pterostigma, Rs arising at the same level of cubital fork and equal length of spur of hind tibia and first tarsal segment.

80. ***Hagenomyia eurystictus*** (Gerstaecker) Comb. nov.

1884. *Myrmeleon eurystictus* Gerstaecker, *Mitt. natur. Ver neu Vorpomm u. Rugen,* **16** : 22.

Diagnostic characters : Labium, maxillary and labial palpus, clypeus and gena : yellow but clypeus with a longitudinal brown stripe. Labrum : brown with a dark spot on each side. Antenna : black. Vertex : black with wavy corrugations. Pronotum (Pl. 4, fig. 1) : broader than long with a transverse concavity at middle. Meso- and metanotum : black. Forewing (Pl. 9, fig. 1) : broad, brown, except yellowish costa; all veins and crossveins black; Sc, Cu_1 and Cu_2 with brown bands; a few costals crossed before pterostigma; large milk-white irregular spot at pterostigma touching costal margin; 9 crossveins before Rs. Hindwing (Pl. 9, fig. 1) : longer than forewing, 7-8 crossveins before Rs. Legs : coxa and femur yellow but tibia and tarsus black; spur of hind tibia as long as first tarsal segment. Abdomen (Pl. 4, fig. 2) : blackish.

Material examined : 1 ex. (♀) : India, Meghalaya, Shillong, Risa colony, 4.ix.1974 (coll. R. Mathew).

Distribution : India (Meghalaya).

Remarks : The species with large milk-white pterostigma touching the costal margin on both wings distinguishes it from other related species of India. Some of the characters, namely, largest breadth of wing at pterostigma, origin of Rs at the same level of cubital fork, spur of hind tibia not longer than first tarsal segment led the author to justify the placement of the species in *Hagenomyia* as comb.nov. The species is for the first time recorded from Meghalaya.

81. ***Hagenomyia nigrinus*** (Esben-Petersen), Comb. nov.

1927. *Myrmeleon nigrinus* Esben Petersen, *Ann. Mag. nat. Hist.*, (9)**20** : 345-347.

Description (Esben-Petersen, 1927) : "Labrum, clypeus, genae and lower part of face strongly yellowish, a very narrow streak along margin of the eyes also yellowish. The face below antennae shining black, vertex black, rugose and somewhat raised. Palpi brownish black. Antennae short, black, clavate. Prothorax black broader than long with a narrow interrupted yellowish longitudinal median streak and with rounded front angles which are narrowly yellowish-margined. Meso-, metathorax and abdomen black with very short hairs. All the coxae and legs strongly reddish

yellow; the apex and posterior margin of fore-femora, the apical three fourths of intermediate femora and a band near tip of hind femora shining blackish; a band at the tip of each tibia and a streak along the front part of fore tibia and along hind part of intermediate and hind tibiae shining black; spurs of fore legs straight and almost as long as 1st and 2nd tarsal joints united. Wings hyaline, shining unspotted and rather broad; forewings almost rounded at tip; hindwing more pointed; venation dark; Sc + R sometimes paler and in that case with dark streaks and all veins with short hairs; stigma white, oval and very distinct, largest in forewings; it does not reach the front margin. Apical area rather broad, with cross veins forming two irregular rows. In the costal area of forewing some veinlets crossed just before stigma. Abdomen : 24-29 mm. Forewing : 36-45 mm. Hindwing : 35-44 mm."

Material examined : 1 ex., (Abdomen missing) India, Arunachal Pradesh, Itanagar, 8.ix.1985 (coll. T. Sengupta).

Distribution : India (Arunachal Pradesh). Elsewhere : Sri Lanka, Sumatra and the Phillipines.

Remarks : Esben-Petersen (1927) described the species as noted above under the genus *Myrmeleon.* But the crossed costal veinlets before pterostigma separates this species from the genus *Myrmeleon* and includes it under *Hagenomyia.* Therfore it is considered as *Hagenomyia nigrinus* (Esben-Petersen), comb.nov. The specimen as studied, agrees well with the description as given by Esben-Petersen (1927) with a few variations. Quite a large number of costal crossveins crossed before pterostigma; tibiae of all legs fully black and with pale venation. As the abdomen is missing so it is not possible to give the genitalic details of the species. The species is for the first time recorded from India including Arunachal Pradesh.

*82. ***Hagenomyia monticolla*** (Navas)

1937. *Baliga monticolla* Navas, *C. R. congr. int. Zool.*, **12** : 1275.

1984. *Hagenomyia monticolla* Ghosh, *Rec. zool. Surv. India, Occ. Paper, no.* **52** : 21.

Description : (*Vide* Navas, 1937) "Caput inferne cum labro et clypeo flavum; fronte nigra, nitida; vertice et occipite nigris, opacis; oculis globosis, fuscis; palpis flavis; antennis fusco-nigris. Thorax inferne falvo-albus, sub alas et superne fusco-niger. Pronotum transversum, fascia media longitudinali ferruginea. Abdomen fuscum, breviter pallido pilosum, inferne pallidius basi et apice, cercis superioribus ♂ brevibus, triangularibus, declivibus, nigro pilosis; lamina subgenitali triangulari brevi, pilis nigris. Pedes fulvi, fusco setosi, superne fere fusci; calcaribus testaceis, subtectis, metatarsum excedentibus; tarsis testaceo-ferrugeneis. Alae apice acutae, membrana fere hyalina, reticulatione fusca, pilis fuscis longiusculis, stigmate albido, antici angustato, costum haud attingente. Ala anterior 9-10 venulis gradatis citra stigma in area costali, 7 venulis radialibus internis, ultima areola fere divisa; sectore radii 14 ramis; area cubitali interna medeo biareolata, externa pluriareolata, inter lineam plicatum tribus tractibus 2,3,4 areolatis; vena axillari 2 cum 3 tractu medio fusa; margine externa convexo. Ala posterior apice ferrugineo limbata (ad marginem apicalem et externum); 5 venulis radialibus internis; 16 ramis sectoris radii, spatio intercubitum et lineam plicatum posteriorem tractu longo interno uniareolato, externo breviore biareolato; vena axilari, 2 a 3 discreta, venula cum illa connexa; pilula axilari minuta, testacea. Long. corp. ♂ 31 mm. Long. al. ant. 36 mm. Long. al. post. 37 mm."

Distribution : India (West Bengal : Kurseong).

Remarks : Markl (1954) merged the genus *Baliga* Navas with *Hagenomyia* Banks. Ghosh (1984c) therefore included the species *B. monticola* under the genus *Hagenomyia.*

83. ***Hagenomyia jamduarensis*** Ghosh

1984. *Hagenomyia jamduarensis* Ghosh, *Rec. zool. Surv. India, Occ. Paper, no.* **52** : 20.

Diagnostic characters : Clypeus : with an "u" - shaped black spot connected to a black stripe below antennae. Antenna : black; large black spot between antennae. Vertex : with two rows of black spots - 4 longitudinal spots at middle, two rounded spots on either side. Pronotum (Pl. 5, fig. 1) : with a narrow median, longitudinal black stripe on upper half and a broad stripe on each side. Meso- and metanotum : with a median black stripe. Wings (Pl. D, fig. 1) : veins black; Sc and R pale. Forewing : few costals crossed before pterostigma; 9 crossveins before Rs. Hindwing : 4 crossveins before Rs. Legs : femora and tibia with elongated black mark on each; spur of hind tibia with elongated black mark on each; spur of hind tibia almost as long as first tarsal segment. Abdomen (Pl. 5, figs. 2 & 4) : dark brown, 1st tergite with a black, spiny projection at posterolateral corners; last four tergites black; genitalia in male as in Pl. 5, fig. 3.

Material examined : 4 exs., (♂♀) : India, Assam, Jamduar, 8.iv.1973 (coll. S.S. Saha and party).

Distribution : India (Assam).

Remarks : Ghosh (1984c) described the species from Assam.

Genus 45. ***Talosus*** Navas

1923. *Talosus* Navas, *Mem. Accad. N. Lincei.* (2)**6** : 35.

Type species : *Talosus oberthurai* Navas.

Diagnostic characters (Navas, 1923) : "Caput antennis thorace brevioribus, insertione distantibus, clava elongata, parum dilatata. Prothorax transversus. Abdomen cylindricum alis brevus. Pedes mediocres, tibis brevioribus seuis femoribus, calcaribus primo tarsorum articulo subaequalibus; tarsis articulo primo elongato, sequentibus brevibus, inter se subaequalibus, quinto longiore primo. Alae acutae, area costali simplice, radiali pluribus venulis citra sectorem; linea plicata posteriore, seu ramo accessorio cubiti manifestom maxime in ala anteriore. Ala anterior area costali aliquot venulis furcatis citra stigma; ramo cubiti spurio seu interno ultra venulam secundam postcubitalum postcubito inserto; ana postcubitali partim biareolata; area apicali duplici serie venularum instructa. Ala posterior area apicali una serie venularum gradatum, area radiali saltem 3 venulis internis seu citra sectorem, dotata."

Distribution : India.

Remarks : As the material has not been studied, the original description of the genus is given after Navas (1923). However, the presence of posterior banksian line, spurious cubital branch,

several crossveins before Rs, partially biareolate postcubital area in forewing and atleast 3 cross veins before Rs in hindwing are some of the important characters for the genus.

*84. ***Talosus oberthuri*** Navas

1923. *Talosus oberthurai* Navas, *Mem. Pont. Acad. Nuovi Lincei.*, (2)**6** : 35.

1984. *Talosus oberthurai* Navas, *Rec. zool. Surv. India, Occ. Paper, no.* **52** : 27.

Description (Navas, 1923) : "Caput fronte et vertice atris, nitidis; labro et parte anteriore clypei flavo-testaceis; occipite piceo; oculis fuscis; palpis flavo-testaceis; articulo ultimo labiallum fusiformis acuto; antennis nigris, clava parum dilatata. Thorax fuscus, fusco et fulvo-pilosus. Pronotum antorsum leviter angustatum, angulis anterioribus rotundatis; fusco-ferruginum, stria fulva media longitudinali et macula ad angulos anteriores, fulvis.

Abdomen fuscum, fulvo griseo breviter pilosum; valves ♀ testaceis, spinulis pelisque nigris; stylis duobus cylindricis, brevibus, fuscis. Pedes testacei testaceo pilosi, nigro setosi; tibiis anterioribus basi et apici nigris, femoribus mediis et posterioribus subtotis fulvo-fuscis; calcaribus testaceis; rectis primum tarsorum articulum aequantibus; tarsis anterioribus testaceis, apice articulorum et ultimo toto nigro; intermediis et posterioribus totis nigris.

Alae hyaline, irideae; reticulione subtota fusca; veins subcosta, radio, procubito et cubito testaceo striatis; stigmate flavo, elliptico rotundato; costum haud attingente. Ala anterior fere 6-8 venulis radialibus internis; sectore radii 15 ramis; inter ramum accessorium et ramum anteriorem cubiti duplici serei areolarum, and medium 3-4; in area postcubitali fere 5 venulis gradatis. Ala posterior fere 5 venulis radialibus internis; sectore radii 16 ramis; area postcubitali angusta; simplici; ramo accessorio parum definito, inter ipsum et ramum anteriorem cubiti una serie areolarum, inter ipsum et marginem posteriorem 3-4. Long corp. ♀ - 37 mm; al. ant. 43 mm; al post. 42.5 mm."

Distribution : India (West bengal : Darjeeling dist., Kurseong).

Remarks : Navas (1923) described the species on the basis of females. The species, however, is not available for study. Black antennae; dark-brown pronotum with a mid-dorsal longitudinal yellow stripe and yellow spot at anterior angle; black apices of tibia and tarsus; forewing with yellow pterostigma and with 6-8 crossveins before origin of Rs and hindwing with 5 crossveins before origin of Rs are some of the characters for distinguishing the species from its nearest allies.

Tribe iv. DISTOLEONTINI Banks

The tribe includes the members of its erstwhile counterparts including Formicaleonini, Nemoleonini and Protoplectrini *Sensu* Markl (1954), all of which have been considered as synonyms of Distoleontini by Holzel (1972). It is reported to be distributed throughout the world. Presently, only 13 genera are known from India, of which only 5 are dealt with hereunder. Of these, the genera *Allogama* and *Dolicholeon* are not included in the key as the literature is inaccessible for *Allogama* and the diagnostic characters as included are not sufficient to include the genus *Dolicholeon* in the key.

Key to the genera of the tribe DISTOLEONTINI

1. Forks of Cu in forewing parallel for a certain distance; 1A also parallel to these forks. ..... *Creoleon* Tillyard

- Forks of Cu divergent and 1A not parallel to the upper but to the lower branch only and that even for a short distance. 2

2. Spurs about as long as the two basal tarsal segments taken together. ..... *Neuroleon* Navas

- Spurs always longer than the two basal tarsal segments taken together. ..... *Distoleon* Banks

Genus 46. ***Creoleon*** Tillyard

1860. *Creagris Hagen, Stettin, ent. Atg.*, **21** : 364.

1918. *Creoleon* Tillyard, *Proc. Linn. Soc. N. S. Wales*, **43** : 436.

1954. *Creoleon*, Markl, *Verh. naturf. Ges.*, **65** (no. 2) : 241.

1972. *Creoleon*, Holzel, *Beitr. naturk. Forsch. SudwDtl.*, **1** : 60.

1984. *Creoleon*, Ghosh, *Rec. zool. Surv. India, Occ. Paper, no.* **52** : 39.

Type species : *Myrmeleon lugdunense* Villers

Diagnostic characters : Forewing : with inner radial field having one vein; Cu with parallel forkings; two rows of cells present between forks of Cu and these cells are separated by a nearly straight vein. Legs : with tarsus shorter than the tibia. Abdomen : ectoproct in male short and cylindrical or oval.

Distribution : Italy, Spain, North Africa, Israel, India and Sri Lanka.

Remarks : Amongst a total of five species known from India, only one is dealt with.

85. ***Creoleon griseus*** (Klug)

1834. *Myrmeleon griseus* Klug, *Symb. Phys.* **iv**, Tafel 36.

1853. *Myrmeleon perfidus* Walker, *Cat. Brit. Mus. Neur.* **2** : 350.

1853. *Myrmeleon sedulus* Walker, *Ibid.*, p. 355.

1853. *Myrmeleon adversus* Walker, *Ibid.*, p. 358.

1868. *Creagis perfidus* MacLachlan, *J. Linn. Soc.*, **9** : 277-278.

1972. *Creolen griseus* Holzel, *Beitr, naturk. Forsch. SudwDtl.*, **1** : 61.

1984. *Creoleon Griseus*, Ghosh, *Rec. zool. Surv. India, Occ. Paper, no.* **52** : 40.

Diagnostic characters : Body colour dark brown. Vertex : with a broad median stripe. Antenna : ferrugineous. Pronotum : broader than long with four narrow stripes. Meso- and metanotum black. Legs : dark brown. Wings (Pl. C, fig. 3) : narrow; pterostigma yellowish and indistinct; veins yellow and membrane without shade or spot. Forewing : without crossvein between

2A & 3A. Hindwing : shorter and narrower than forewing. Abdomen : black; not longer than wings in males.

Material examined : 1 ex. ♀ (damaged) : India, Assam, Raimona, 14.vi.1973 (coll. S.S. Saha and party).

Distribution : India (Assam; West Bengal; Bihar; Orissa; "North India"; Maharashtra; Tamil Nadu). Elsewhere : Egypt; Sudan; Israel; Iran.

Remarks : The species is for the first time recorded from Assam.

Genus 47. ***Allogama*** Banks

1912. *Gama* Navas, Broteria, **10** : 57.

1943. *Allogama* Banks, Bol. ent. Venezolana, **2** : 166.

1984. *Allogama*, Ghosh, Rec. zool. Surv. India, Occ. Paper no. **52** : 41.

Type species : *Gama irene* Banks

Distribution : India : West Bengal and Karnataka.

Remarks : Literature being inaccessible for the genus, the diagnostic characters for the genus are not included. The genus, formerly considered under the tribe Creoleonini by Markl (1954), has subsequently been transferred to DistoLeonini by Holzel (1972). The single Indian species of the genus is reviewed below.

*86. ***Allogama irene*** Banks

1939. *Gama irene* Banks, *Bull. Mus. comp. Zool. Harv.*, **85**(7) : 456.

1977. *Allogama irene* Ghosh & Sen, *Rec. zool. Surv. India*, **73** : 302.

1984. *Allogama irene*, Ghosh, *Rec. zool. Surv. India, Occ. Paper no.* **52** : 42.

Diagnostic characters : Vertex : with two black bands from eye to eye; six dull black spots behind the bands - two at middle and two on each side. Pronotum : with grey marks - a median line and a broader stripe and a spot on either side. Mesonotum : with a pale median stripe and some spots laterally. Metanotum : with a deep black transverse mark on each side. Forewing : a distinct dark spot at rhegma; spot at end of anal extending to Cu and coming back to anal; pterostigma brownish. Hindwing : distinct dark spot at rhegma. Legs : spotted and banded with black; spur as long as four tarsal joints taken together.

Distribution : India (West Bengal : Darjeeling; Karnataka).

Remarks : The species, though not studied, may be easily identified by the characters of vertex, thorax and wings as given by Banks (1939). So, the author considers it a good species.

Genus 48. ***Neuroleon*** Navas

1909. *Neuroleon* Navas, *Act. Mem. Congr. Nat. Esp.*, **1** : 148.

1912. *Ganussa* Navas, *Insecta*, **2** : 31.

1912. *Nelees* Navas, *Mem. R. Acad. Cienc. Artes, Barcelona*, **11** : 114.

1914. *Bareeus* Navas, *Mem. R. Acad. Cienc. Artes, Barcelona*, **11** : 114.

1914. *Maldonatus* Navas, *Ann. Soc. Sci. Brux.*, **38** : 247.

1930. *Afroclimacius* Navas, *Broteria*, **26** : 128.

1930. *Oligoleon* Esben-Petersen, *Denkschr. Akad. Wiss. Wien*, **102** : 202.

1938. *Neleoma* Kimmins (nec Navas, 1914), *Ann. Mag. nat. Hist.*, **11**(2) : 366.

1972. *Neuroleon*, Holzel, *Beitr. naturk. Forsch. SudwDtl.*, **1** : 49.

Type species : *Myrmeleon arenarius* Navas

Diagnostic characters : Body : usually small, with less spotted wing. Forewing : with costal field having one row of cells; Cu_1 not parallel to Cu_2; Cup well developed. Hindwing : with inner radial field having only one crossvein. Legs : short and stout; spur short and in all pairs hardly longer than 1st and 2nd tarsal segments taken together. Abdomen : with ectoproct in male oval.

Distribution : Spain, Rumania, Greece, North Africa, Malagasy, Saudi Arabia, Iran, Afghanistan, Pakistan, India, Indonesia, Malaysia and Micronesia.

Remarks : Amongst a total of three species, one indetermined species is dealt with here.

87. ***Neuroleon*** sp.

The species, a female, is damaged. Therefore it is not possible to deal with the details of the characters. However, the characters of the wings may be enumerated below.

Wings : hyaline, apex subacute; venation : whitish with brown bands; crossveins wholly or partially black; base of pterostigma, crossveins at base and apex of hypostigmatic cell, some apical gradate crossveins, some gradate veinlets at disc towards apex, apical part of Cu_2 + 1A and some of the forked veinlets towards posterior margin clouded with brown. Forewing : 7 crossveins before Rs. Hindwing : 1 crossvein before Rs.

Material examined : 1 ex. (F) : India : Mizoram, Saiha, circuit house campus, 6.iv.1994 (coll. A.K. Hazra and party).

Distribution : India (Mizoram).

Remarks : The genus as well as the species are for the first time recorded from Mizoram.

Genus 49. ***Distoleon*** Banks

1815. *Formicaleo* Leach, *Edinburgh Encycl.*, **9** : 138.

1865. *Formicaleo, Brauer, Verh. zool. bot. Ges. Wien.*, **15** : 904.

1910. *Distoleon* Banks, *Ann. ent. Soc. Am.*, **3** : 42.

1911. *Formicaleon* Banks, *Ann. ent. Soc. Am.*, **4** : 16.

1918. *Eidoleon* Esben-Petersen, *Ark. zool.*, **11** (no. 26) : 15.

1972. *Distoleon*, Holzel, *Beitr. Natur. Forsch. Sudwdtl.*, **1** : 55.

Type species : *Distoleon verticalis* Banks.

Diagnostic characters : Antenna : shorter than head and thorax taken together. Wings : generally densely spotted. Forewing : with Rs arising beyond the level of fork of Cu, basal portion of which is bent at right angle so as to meet R; Cu_2 not parallel, neither to Cu not to hind margin. Legs : densely hairy; hindtibia and femur in male generally with long and dark hairs; tarsus much shorter than tibia; tibial spur longer than basal tarsal segment; spur of hind tibia as long as 4 tarsal segments taken together.

Distribution : Southeast Europe, Africa, Saudi Arabia, Iran, Afghanistan, Korea, Japan, India, Burma, The Phillipines and Australia.

Remarks : Amongst a total of 14 species known from India, only four are dealt with.

Key to the species of the genus ***Distoleon***

1. Pterostigma of wings rosy or reddish. 2
- Pterostigma of wings whitish or yellow. 3
2. Pterostigma rosy; pronotum with 4 irregular pitchy stripes. ..... *verendus* (Walker)
- Pterostigma reddish, pronotum with a broad dark stripe on either side. .. *bivittatum* (Banks)
3. Wings with milk-white spaces; hindwing with a lance-shaped brown mark at the apex of Cu_1 and M; Pterostigma yellow. ..... *sambalpurensis* Ghosh
- Wings without milk-white space; pterostigma whitish. ..... *audax* (Walker)

88. ***Distoleon verendus*** (Walker)

1853. *Myrmeleon verendus* Walker, *Cat. Brit. Mus. Neur.*, **2** : 342.

1853. *Myrmeleon minax* Walker, *Ibid.*, 343.

1868. *Formicaleon verendus*, MacLachlan, *J. Linn. Soc.*, **9** : 277.

1984. *Distoleon verendus*, Ghosh, *Rec. zool. Surv. India, Occ. Paper no.* **52** : 49.

Diagnostic characters : Head (Pl. 1, figs. 1-5 & 7-8) : blackish about base of antenna; vertex with several blackish spots. Antenna : a tawny band on fore border of each segment. Pro-meso- and metanotum (Pl. 3, fig. 1) : with four irregular black stripes. Wings (Pl. 2, figs, 1-2) : costals mostly simple; pterostigma rosy and indistinct in hindwing; forks of marginal veinlets clouded with pale brown at base along hind border to apex. Forewing : with a dark brown dot in male at

tip of Cu. Hindwing : an oblong brown spot near hindborder adjacent to apex in female. Legs (Pl. 1, fig. 6) : with brown dots. Abdomen (Pl. 3, figs. 2-4) : shorter than wings. Male and female genitalia : as in pl. 3, figs. 3 & 4.

Material examined : 1 ♀ : India, Arunachal Pradesh, Jegong, Rupa, 13.x.1996 (coll. S.K. Mondal).

Distribution : India (Himachal Pradesh; Orissa; "North India", Arunachal Pradesh).

Remarks : The species is for the first time recorded fromArunachal Pradesh. Figures of the species have been given after Ghosh, 1984c.

*89. ***Distoleon bivittatum*** (Banks) comb. nov.

1914. *Formicaleon bivittatum* Banks, *Rec. India Mus.*, **8** : 355.

1977. *Formicaleon bivittatum*, Ghosh & Sen, *Rec. zool. Surv. India*, **72** : 305.

Description : (After Banks, 1914) "Face pale; a large-dark inter antennal band from eye to eye extending above and below antennae, above this is a narrow dark band with a stripe each side behind to the pronotum, and two spots in middle of vertex reaching towards these stripes; antennae annulate with brown, long and slender; pronotum longer than broad, with a broad dark stripe on each side and the posterior corners dark; thorax dark with median pale stripe, extending a little way back on the abdomen, rest of abdomen brownish; pleura with two dark stripes under each forewing; legs pale, a dark band at extreme tip of tibia and tibiae I & II with dark spot on outer side near base, legs slender, with long black bristles, spurs long, not much curved, about as long as four joints, last joint much longer than the first one. Wings hyaline, veins interruptedly dark and pale; stigma reddish, the forkings of veins near the outer margin and apex of wing are clouded with dark. Hindwings much longer and narrower than forewings, sharply acute at tip; forewings very broad at stigma; five crossveins before radial sector, about 16 branches to radial sector and with five crossveins to cubital fork; a line bending up from end of anal and running through middle of cubital area; in hindwings, anal ends before the origin of the cubital fork. The wings are very similar to *F. verendus* but the pronotum and legs are more slender. Expanse 70-80 mm.

From between Thingannyinaung and Myawadi, L. Burma, 24-28 Nov., 1911, 900 ft. (F.H. Gravely)."

Distribution : India (Arunachal Pradesh : Abor). Elsewhere : Burma.

Remarks : Banks (1916) states, "*Distoleon* will replace *Formicaleo* as used by most authors. *Formicaleo* was originally applied only to the type species of *Myrmeleon* and so is a synonym of it. *Formicaleon* Banks is a synonym of *Distoleon*." This statement of Banks and also the length of the spurs of the species led the author to consider it as *Distoleon bivittatum* (Banks) comb. nov. Though the material has not been studied by him but from description of Banks as noted above, it has been settled.

90. ***Distoleon sambalpurensis*** Ghosh

1984. *Distoleon sambalpurensis* Ghosh, *Rec. zool. Surv. India, Occ. Paper no.* **52** : 50.

Diagnostic characters : Face : yellow. Antenna : black with yellow rings. Vertex : with two rows of black spots. Pronotum (Pl. 7, fig. 1) : black with a pale yellow median longitudinal line and a narrow line on each side. Meso- and metanotum black. Wings : some translucent milk-white space on disc. Forewing : Sc, Cu and anals brown with yellowish bands; pterostigma yellow with a dark spot at base; crossveins and forked veinlets mostly marked with brown clouds; base and apex of hypostigmatic cell with smoky brown patches; with brown marks - one at apical portion of M & Cu_1, a large spot at the junction of Cu_2 & 1A which is extending obliquely upto middle of cubital area; 9 crossveins before Rs. Hindwing : a smoky brown spot at tip of M and Cu_1 extending obliquely upto 1st and 2nd branches of Rs; 1 crossvein before Rs. Legs : with dense dark spots. Abdomen : dark but 6th and 8th tergites anteriorly yellow; tip in female as in Pl. 7, fig. 2.

Material examined : 3 exs. (♂♀) : India, West Bengal, Darjeeling, Churanti Hill, 12.iii.1974 (coll. H.K. Bhowmick and party). 1 ex., (damaged) : Assam, Dt. Kamrup, Manas Sanctuary, Mothorguri, 13.ix.1975 (coll. S.S. Saha).

Distribution : India (West Bengal : Darjeeling; Assam; Orissa).

Remarks : The species is for the first time recorded from Assam.

91. ***Distoleon audax*** (Walker)

1853. *Myrmeleon audax* Walker, *Cat. Brit. Mus. Neur.*, **2** : 338.

1853. *Myrmeleon gravis* Walker, *Ibid.*, : 339.

1853. *Myrmeleon vafer* Walker, *Ibid.*, : 345.

1853. *Myrmeleon dirus* Walker, *Ibid.*, : 346.

1853. *Myrmeleon lentus* Walker, *Ibid.*, : 346.

1853. *Myrmeleon desperatus* Walker, *Ibid.*, : 359.

1853. Myrmeleon *perniciosus* Walker, *Ibid.*, : 360.

1853. *Myrmeleon malefidus* Walker, *Ibid.*, : 364.

1853. *Myrmeleon acutus* Walker, Ibid., : 377.

1853. *Myrmeleon insomnis* Walker, *Ibid.*, : 385.

1865. *Formicaleo longicornis* Brauer, *Novara Exp. Zool.*, **2**, Neur., : 42.

1900. *Formicaleo morpheus* Kirby, *Monogr. ChristmasIsl.*, : 140.

1909. *Formicaleo audax*, Weele, *Notes Leyden Mus.*, **31** : 19.

- *Distoleon audax*, Ghosh (in press), In *State Fauna Series, West Bengal.*

Diagnostic characters : Antenna : black, narrowly annulated with yellow. Head : with a black stripe between antennae; two black triangles above antennae. Vertex : with two rows of black markings. Pronotum : with a narrow median and two lateral irregular luteous stripes. Leg : tibia yellow beneath but densely spotted with black above. Wings (Pl. C, fig. 4) : with acute tip; Sc and R spotted with white; pterostigma whitish, oval, small and with a dark spot at the junction of R and Sc; apical part with pale oblique lines where veins are white; gradate veins broadly suffused with brown; forewing with a brown spot at the junction of Cu_2 and 1A. Abdomen : shorter than wings; dorsum brown with luteous markings.

Material examined : 3 exs., (♀♀) : India, Meghalaya, East Garo hills, Songsok, 13.iv.1973 (coll. S. Biswas); Tripura, Amarpur, 5.iii.1991 (coll. G.K. Srivastava and party); Mizoram, Lunglei, 11.iv.1994 (coll. S.K. Ghosh & M. Prasad).

Distribution : India (West Bengal : Darjeeling; Meghalaya, Mizoram, Tripura, Maharashtra, Andaman & Nicobar Islands). Elsewhere : Nepal, Sri Lanka, China, Japan, Insulinde (Papuan and Malayan Archipelago); Australia; Damansland, New Zealand.

Genus 50. ***Dolicholeon*** Navas

1929. *Dolicholeon* Navas, *Rev. Acad. Cienc.*, **12** : 190.

1977. *Dolicholeon*, Ghosh & Sen, *Rec. zool. Surv. India*, **72** : 305.

Diagnostic characters : Wings : costal area narrow; veins simple; apical area narrow; series of gradate veins dividing posterior margin. Forewing : with anterior and posterior banksian line; false branch of cubitus beyond primary cubital vein. Hindwing : without distinct banksian line; cubital area biareolate.

Distribution : India.

*92. ***Dolicholeon substigmalis*** Navas

1929. *Dolicholeon substigmalis* Navas, *Rev. Acad. Cienc.*, **12** : 191.

1977. *Dolicholeon substigmalis*, Ghosh & Sen, *Rec. zool. Surv. India*, **73** : 305.

Description : (After Navas, 1929) "Caput antennis longis, fuscis, apice articulorum fulvo, 9.5 mm. longis. Pronotum fuscum, linea longitudinal media et alia laterali irregulari fulvis. Andomen subtotum fuscum, fulvo et fusco breviter pilosum, tergites maculis fulvis irregularitus parumque definitis; lamina subgenitali triangulari, apicem abdominis haud attingente, fulva, fusco pilosa. Pedes flavi, fusco punctati et setosi; apice articulorum tarsorum et ultimo superne toto fusco. Ala anterior apice practer marginem externum umbris in limbum interruptum, a margine fere separatum, fuscum; area radiali 8 venulis internis; sectore radii 10 ramis. Ala posterior 3 venulis ultimis radialibus fuscis fusco-que limbatis; sectore radii 11 ramis. Long corp ♂ 33 mm; al. ant. 36.5 mm; Al. post. 33.5 mm".

Distribution : India (West Bengal : Kurseong; Maharashtra).

Remarks : The species is not available for study. Except the characters of the pronotum no other characters are convincing to the author. So he reserves his comment on the species.

Tribe V. GLENURINI

The tribe exhibits a rather cosmopolitan distribution in the world and includes a single genus from the region under consideration.

Genus 51. ***Negrokus*** Navas

1930. *Negrokus* Navas, *Mem. pont. Acad. Nuovi Lincei* (2)**14** : 420.

Type species : *N. lebasi* Navas

Diagnostic characters (Navas, 1930) : "Antennae gracilis, thorace longiores, clava angusta, elongata. Prothorax transversus. Abdomen cylindricum, alis brevius. Pedes teretes, tibiis I et II leviter incrassatis; calcaribus nullis; tarsis articulis tribus primis longitudine decres centibus, quinto incrassato, inferne nigro spinulosa seu scopulato, longiore primo. Alae area costali simplici; cellulis plerumque rectangularibus; apis acutae, margine externo convex; area apicali venulis gradatis divisa; linea plicata nulla. Ala anterior sectore radii ultra divisonem cubiti orto; pluribus venulis radialibus internis; angulo cubiti parum aperto; pluribus arcolis regularibus inter ramum anteriorem cubiti et marginem posteriorem; ramo abortivo cubiti primum venulam cubitalem parem excedente; vena axillari seu marginali posteriore longa, angusta, simplice. Ala posterior una venula radiali interna; sectore radii citra furcam cubiti orto; area cubitali externa 2-3 areolata".

Distribution : India.

Remarks : As the genus is not available for study, the description as given by Navas (1930b) is given here for ready reference.

*93. ***Negrokus lebasi*** Navas

1930. *Negrokus lebasi* Navas, *Mem. Pont. Acad. Nuovi Lincei*, (2)**14** : 421.

1984. *Negrokus lebasi*, Ghosh, *Rec. zool. Surv. India, Occ. Paper no.* **52** : 54.

Description (Navas, 1930) : "Caput fuscum, facie testacea, ocules fuscis, antennis fuscis, fulvo anguste annulatis, 7 mm. longis, clava elliptica elongata, debili. Thorax inferne fulvus, ad latera sul alas late fuscus; superne fuscus, testaceo vage maculatus. Pronotum transversum. Abdomen subtotum fuscoferrugineum, fulvo breviter pilosum, margine postico pleurium segmentorum testaceo-ferrugineo. Pedes fulvi, fulvo et fusco pilosi, cylindrici, tibus modice femoribus brevioribus, I & II leviter incrassatis; femoribus II superne III externe fusco lineatis, tibiis externe fusco dense punctatis; tarsis fulvis, apice articularum et quinto subtoto fuscis; unguibus testaceis, subrectis, in angulatum acutum cum tarsorum axis flexis. alae hyaline, irrideae, stigmate suborbiculari, flavido, oblique viso lacteo, radio praeter stigmafulvo; reticulatione subtota fusca, subcosta et radio fulvo striatis; membrane fusco et lacteo maculata. Ala anterior 11-12 venulis radialibus intrnis; sectore 13-14 ramis; stigmate interne ad radium fusco limitato; macula fusca orbiculari ad radium ultra stigma, alia purva, ad rhegma, alia grandiore irregulari ad anastomosim rami obliqui cubiti; umbra

fulva, oblique visa lactea pone maculum orbicularum; marginibus apicali et externo fusco limbatis. Ala posterior una venula radiate interna; sector radii 12 ramis; margine externo fusco limbato, macula exigua fuscescente ad cubitorum et alia grandi fusca subtriangulari inter hauc et apicem; gutta lactea (oblique visa) inter stigma et apicem.

Long corp. ♀ 27 mm. Al. ant. 31.3 mm. Al. post. 36.6 mm."

Distribution : India (West Bengal : Kurseong).

Remarks : Navas (1930b) described this species based on females. The colour and spots of the legs and a spot near apex beyond pterostigma, in rhegma and an irregular spot at the branch of Cu are some of the distinctive characters for the species. But the study of males is necessary before any comment is made on the species. As the material is not available for study, therefore the original description as given by Navas (1930b) is included here for future investigation.

UNCERTAIN POSITION

Genus 52. ***Baga*** Navas

1930. *Baga* Navas, *Rev. Acad. Cienc.*, **13** : 37.

Type species : *Baga montana* Navas

Description (Navas, 1930) : "Antennae insertione distantes, gracilis, clava debili suc parum dilata. Prothorax transversus. Abdomen cylindricum, alis brevius, cerci haud exertis, valvae formis. Pedes mediocres, tibiis brevioribus series femoribus, calcaribus rectis, primo tarsorum articulo subaequalibus, vel paulo longioribus (in pede 1); primo tarsorum articulo elongato, tribus sequentibus brevibus, quinto longiore primo. Alae acutae, area costali simplice, angusta, apicali series venularum gradatarum divisa; stigmate opaco-subelliptico; reticulione densa; pluribus venulis radialibus internis; linea plicata posteriore manifesta; angulo cubiti aperto. Ala anterior linea plicata anteriore ad medium indicata; ramo abortio cubiti primam venulam cubitalem excedente; inter ramum anteriorem cubiti et lineam plicatum plerumque 2, in medio 3 arealis; area axillari interne serie venularum gradatarum divisa. Ala posterior una serie areolarum inter cubitem et lineam plicatum, pluribus inter cubitem et lineam plicatum, pluribus inter hauc et marginem posteriorem; axilla ♂ pilula dotata."

Distribution : India.

Remarks : Due to the paucity of material the species has not been studied. So the original description of genus after Navas (1930c) is included above. However, several crossvein before Rs, presence of anterior and posterior banksian line, presence of apical gradates in forewings are worth mentioning for generic diagnosis.

*94. ***Baga montana*** Navas

1930. *Baga montana* Navas, *Rev. Acad. Cienc.*, **13** : 38.

Description (Navas, 1930) : "Caput nigrum, en vertice et occipite opacum, in facie nitens, clypeo et labro flavis; oculis fuscis, palpis flavis, ultimo articulo labialium subfusco, antennis totis fusca, ad articulationes obscurioribus, longitudine thoracis vel longioribus, clava vix dilatata, acutis. Thorax fusco ferrugineus; pronotum transversum, margine anterior late rotundato, fascia fulva ad margines lateralis. Abdomen fuscum, in ♂ longius, stylus ♀ fuscis. Pedes fulvo-testacei; fusco setose; femoribus fascia lata ante apicem, tibiis apice tarsis subtotis fuscis, primo articulo basi testaceo; calcaribus testaceis, rectis, anterioribus primum tarsorum articulum leviter superantibus, posterioribus haud equantibus. Alae acutae, margine externo convexo, hyaline, irideae, stigmate albofulvo, elliptico, in ♂ magis elongato, nec costam attingente; reticulatione fusca; subcosta et radio parum distincte fulvo striatis. Ala anterior area apicali interne duplici serie venularum gradatarum divisa, 7 venulis radialibus internis, 14 ramis sectoris radii, in area axillari 5-6 venulis gradatis. Ala posterior 5 venulis radialibus internis; 16 venulis gradatis. Ala posterior 5 venulis radialibus internis; 16 ramis sectoris radii; pilula ♂ globosa fusca. ♂ Long corp. 35.5 mm, al. ant. 38 mm, al. post. 37.5 ♀ : Long corp. 30.5 mm, al. ant. 38 mm, al. post. 37.5 mm. Loc. Kurseong."

Distribution : India (West Bengal : Kurseong, Darjeeling dt.).

Remarks : Original description of the species as given by Navas (1930c) has been included as the material is not available for study. The markings in the pronotum, colour of pterostigma and the measurements of wings are though salient features of the species but further comments are not possible without examination of the characters in details.

Family I. ASCALAPHIDAE

The ascalaphids are beautiful insects and superficially resemble Odonata by the colour and form of the wings and, Rhopalocera of the order Lepidoptera by long and clubbed antennae.

Diagnostic characters : Antenna : Long, slender and strongly clavate at apex. Eye : simple, entire or divided by a groove. Thorax : stout. Wings (Forewing : Pl. 26, fig. 1) : with long or short excision at the extreme base of posterior margin; axillary angle generally prominent; hypostigmatic cell not differentiated; pterostigma large or small; 2-4 rows of apical cells beyond pterostigma; Cu_2 strong and free but running parallel and very close to A_1; radial cuneata area always present (Comstock, 1918). Leg : spur on hind tibia as long as first, or equal to two or three basal tarsal segments taken together. Abdomen : laterally compressed; shorter or longer than wings. Male genitalia : with ectoproct in the form of a pair of convex plates or forceps or projections and without trichobothria; gonarcus hood-like and arch-like; parameres either connected to gonarcus or immovably fixed to it apically; pelta, a vertical plate, situated between the parameres; pulvinus, a bag-like, thumb-like or finger-like eversion of the gonosaccus which is situated on either side of gonarcus and clothed with gonosetae; hypandrium internum stem-like, very small, weakly sclerotised and unpigmented. Female genitalia : with ectoproct usually like a pair of convex plates; ventrovalvae, a pair of hairy plates situated below the 8th tergite; interdens, a plate with a downwardly directed tooth situated centrally or apically between the ventrovalve; linguella, tongue-like, usually unpaired structure situated under the lateral hind margin of 8th sternite; distivalvae, a pair of valve situated distally of the linguella and ventrally of the 9th tergite; spermatheca small, usually sclerotised and unpigmented.

BRIEF REVIEW ON CLASSIFICATION

Burmeister (1839), Lefebvre (1842), Rambur (1842), Walker (1853) and others grouped the earlier described species under the generic divisions or sections. MacLachlan (1873b) attempted to arrange about 103 species in 27 new generic groups. Van der Weele (1908) classified the family into three subfamilies, viz., Protascalaphinae, Haplogleniinae and Ascalaphinae. The first two subfamilies have further been subdivided into several tribes to accomodate different genera while the tribal classification for the last one has been omitted by him (loc. cit.). The author has, however, principally adopted the classification given by van der Weele (Loc. cit.) without considering the tribes.

Key to the subfamilies of the family ASCALAPHIDAE

Eyes entire. ..... Haplogleniinae

- Eyes equally or unequally divided into two parts. ..... Ascalaphinae

Subfamily a. HAPLOGLENINAE

Key to genera of the subfamily HAPLOGLENIINAE

Apical field of both wings with 3 cell rows; without dark-coat; antennae dark coloured but not ringed with light colour. ..... *Protidricerus* Weele

- Apical field of both wings with 2 cell rows; crossveins more or less with dark-coat; antennae pale or somewhat darker but always ringed with light colour. ..... *Idricerus* MacLachlan

Genus 53. ***Protidricerus*** van der Weele

1908. *Protidricerus* van der Weele, *Cat. coll. Selys,* **8** : 61.

1988. *Protidricerus*, Ghosh, *Rec. zool. Surv. India,* **85**(2) : 196.

Type species : *Idricerus exilis* MacLachlan

Diagnostic characters : Antenna : naked, unicoloured and much shorter than forewing. Wings : membrane hyaline; fore and hind border parallel; tip blunt and rounded. Forewing : with semicircular excision at the base of inner margin; apical field with 3-rows of cells; veins unicoloured and without any band; axillary angle almost even. Hindwing; considerably shorter and narrower than forewing. Legs : spur of hindtibia as long as two basal tarsal segments taken together. Abdomen : unicoloured and shorter than hindwing in male.

Distribution : India, China and Japan.

Remarks : The genus is represented by only one species from India which is dealt with here.

95. ***Protidricerus elwesi*** (MacLachlan)

1891. *Idricerus elwesi* MacLachlan, *Trans. ent. Soc. Lond.*, p. 512.

1908. *Protidricerus elwesi*, van der Weele, *Cat. coll. Selys*, **8** : 63.

Diagnostic characters : Head : with dense black hairs. Vertex : grey-haired posteriorly. Thorax : yellow to grey but the ridges grey brown. Wings (Pl. 27, fig. 1) : hyaline, with axillary angle blunt but not prominent; pterostigma yellowish to brown with 3-4 crossveins in fore- and 4-5 in hindwing; apical field with 3 rows of cells. Legs : reddish brown; spur of hindtibia almost equal to first two tarsal segments taken together. Abdomen : dorsally black but ventrally yellow.

Material examined : 1 (♀) : India, Arunachal Pradesh, Tirap dist., Namdapha, Gibbon land, 2.v.1981, (coll. S. Biswas and party).

Distribution : India (Assam and Arunachal Pradesh).

Remarks : The details of the species have been provided in earlier paper (vide Ghosh : 1985a).

Genus 54. ***Idricerus*** MacLachlan

1871. *Idricerus* MacLachlan, *J. Linn. Soc.*, **11** : 200.

1908. *Idricerus*, van der Weele, *Cat. coll. Selys*, **8** : 65.

Type species : *Ascalaphus decrepitus* Walker

Diagnostic characters : Antenna : shorter than wings, straight; club very large, broadly and shortly pyriform; a dense tuft of hairs on face and between antennae. Eye : entire. Thorax : very villose. Wing : elongate, rather narrow, slightly dilated at middle; apex subacute. Forewing : with a semicircular excision at the very base of inner margin followed by a small obtusely angular dilatation; not appendiculate, with network moderately open. Leg : moderately stout; spur of hind tibia hardly as long as 1st two tarsal joints taken together. Abdomen : shorter than wing.

Distribution : Central and South-East Asia.

Remarks : Only one species is represented in N.E. India which is dealt with here.

96. ***Idricerus decrepitus*** (Walker)

1859. *Ascalaphus decrepitus* Walker, *Trans. R. ent. Soc. Lond.*, (2)**5** : 197.

1871. *Idricerus decrepitus*, MacLachlan, *J. Linn. Soc.*, **11** : 240.

1988. *Idricerus decrepitus*, Ghosh, *Rec. zool. Surv. India*, **85**(2) : 168.

Diagnostic characters : Antenna : brown. Thorax : blackish. Wing : hyaline with pointed apex; all crossveins more or less marked with small black spots; pterostigma black with 2-4 crossveins in forewing (Pl. 27, fig. 2) : and with only 4 crossveins in hindwing; appendix of forewing broad and blunt; apical field in both wings with two rows of cells.

Measurement : 2 exs., (♀ ♀) : length of antenna, 24 mm; forewing, 35 mm; hindwing, 30 mm.

Material examined : 2 exs. (♀ ♀) : India, Meghalaya : Risa colony, Shillong, 19.vii.1973, (coll. M. Rynth); Motinagar, 16.vii.1969 (coll. S, Jyrwa).

Distribution : India (Meghalaya; Jammu & Kashmir); Elsewhere : Turkestan.

Subfamily b. ASCALAPHINAE

Key to genera of the subfamily ASCALAPHINAE

1. Forewing or both wings pterostigma short, as long as high; apical field broad. 2
- Pterostigma long; not less than twice as long as high; apical field narrow. 3
2. Body long and densely hairy; wing tip obtuse and angular; hindwing distinctly broadened at hind margin; antenna long, reaching pterostigma of forewing in length. *Agrionosoma* Weele
- Body short or sparsely hairy; wing tip rounded; hindwing not broadened at hind margin; antenna short, not reaching pterostigma of forewing in length. ..... *Suhpalacsa* Hagen
3. Wing tip angular. 4
- Wing tip rounded. 6
4. Abdomen longer than forewing in male; antenna denticulate internally at base. ..... *Acheron* Lefebvre
- Abdomen shorter than fore wing in both sexes; antenna not denticulate internally at base. 5
5. Abdomen in male as long or longer than hindwing; legs slender. ..... *Suphalomitus* Weele
- Abdomen shorter than hindwing in both sexes; legs stout. ..... *Ogcogaster* Westwood
6. Abdomen in males with appendices; antenna as long as wings. ..... *Hybris* Lefebvre
- Abdomen in males without appendices; antenna shorter than wings. .... *Ascalaphus* Fabricius

Genus 55. ***Agrionosoma*** Weele

1908. *Agrionosoma* Weele, *Cat. Coll. Selys,* **8** : 169.

1988. *Agrionosoma*, Ghosh, *Rec. zool. Surv. India,* **85**(2) : 169.

Type species : *Agrionosoma swinhoei* Weele

Diagnostic characters : Body : single coloured, dark, long and densely hairy. Head : small with long dense hairs. Antenna : reaching up to pterostigma of forewing; club elongate, spindleshaped with apex rounded. Eye : lower and upper halves almost equal. Thorax : elongate and densely hairy. Forewing : pterostigma short, as long as high; apical field broad; apex rounded. Hindwing : anal margin distinctly broadened. Leg : slender, dark and less hairy; spur of hind tibia longer than 1st tarsal segment. Abdomen : bare, long, slender and longer than hind wing.

Distribution : India and Thailand.

Key to species of the genus ***Agrionosoma***

Thorax unicolorous; pterostigma of forewing as long as high; abdomen longer than hindwing. ..... *dohrni* Weele

- Thorax with some yellow markings; pterostigma higher than long; abdomen shorter than hindwing in female. ..... *swinhoei* Weele

97. ***Agrionosoma dohrni*** Weele

1908. *Agrionosoma dohrni* Weele, *Cat. Coll. Selys,* **8** : 171.

1988. *Agrionosoma dohrni*, Ghosh, *Rec. zool. Surv. India,* **85**(2) : 170.

Diagnostic characters : Antenna : light brown but club dark and conspicuously ringed with yellow, reaching up to pterostigma of forewing. Vertex : with dark brown and grey hairs. Thorax : greyish brown and clothed with greyish brown long and soft hairs. Forewing (Pl. 26, fig. 1) : hyaline; apex obtuse and angular; pterostigma yellow, almost as long as high; venation brown; pterostigma with 4 crossveins; apical field with 3 rows of cells. Hindwing : shorter and narrower than forewing. Leg : black with black hairs; femur yellow with whitish and black hairs; spur of hind tibia almost equal to first two tarsal segments taken together. Abdomen : longer than hindwing; dark brown with apex of each segment bordered black; 1st segment with long black hairs at middle; other segments with short black hairs.

Measurements : 1 (♂) : length of forewing, 33 mm; hindwing, 27 mm; abdomen, 29 mm.

Material examined : 1 (♂) : India : West Bengal : 1 km. S.W. of Reyana forest rest house on the way to Rambi Hill range, 400 m., Darjeeling, 31.iii.1973, (coll. H.S. Sharma).

Distribution : India (West Bengal : Darjeeling; Sikkim).

*98. ***Agrionosoma swinhoei*** Weele

1908. *Agrionosoma swinhoei* Weele, *Cat. Coll. Selys,* **8** : 169.

1977. *Agrionosoma swinhoei*, Ghosh & Sen, *Rec. zool. Surv. India,* **72** : 232.

Distribution : India (Meghalaya : Khasi Hills).

Remarks : Red-brown or dark brown antenna, yellow occiput with a pair of dark markings behind eyes, thorax with yellow markings, higher than long pterostigma are the important characters to distinguish the species from its nearest allies. As the species is not available for study it is reviewed from literature.

Genus 56. ***Suhpalacsa*** Lefebvre

1842. *Suhpalacsa* Lefebvre, *Guer. mag. Zool.,* **4** : 92.

1866. *Suphalasca* Hagen, *Stettin. ent. ztg.,* **27** : 273.

1868. *Suphalasca* (Part), Brauer, *Verh. zool. bot. Ges. Wien.,* **18** : 397.

1871. *Suphalasca*, MacLachlan, *J. Linn. Soc.,* **11** : 253.

1908. *Suphalacsa*, Weele, *Cat. Coll. Selys,* **8** : 157.

1988. *Suhpalacsa*, Ghosh, *Rec. zool. Surv. India*, **85**(2) : 171.

Type species : *Ascalaphus flavipes* Leach

Diagnostic characters : Body : with scanty hairs. Antenna : straight, approximately reaching about three fourth of the length of forewing, but not reaching pterostigma; club rounded and almost straight. Thorax : smaller than head and scarcely villose; elongate and small, considerably reticulated; anterior and posterior margins almost parallel. Forewing : broad, rounded and excised at base; axillary angle not prominently excised; pterostigma short ad quadrilateral; apical field with 3 rows (seldom 2) of cells. Hindwing : constricted at anal margin. Leg : spur of hind tibia as long as first joint of tarsus. Abdomen : straight, without appendices and half or three fourths of the length of hindwing.

Distribution : Africa, Israel, Taiwan, India, Indonesia, the Phillipines and Australia.

99. ***Suhpalacsa orsedice*** Banks

1914. *Suhpalacsa orsedice* Banks, *Proc. Acad. nat. Sci.*, **66** : 617.

1988. *Suhpalacsa orsedice*, Ghosh, *Rec. zool. Surv. India*, **85**(2) : 171.

Diagnostic characters : Antenna : not reaching pterostigma of forewing. Wings (Pl. B, fig. 4) : hyaline; tip rounded; pterostigma blackish, scarcely longer than high with four veinlets in forewing (Pl. 27, fig. 5) but hindwing pterostigma little longer than high with five veinlets; two rows of cells beyond pterostigma; Rs in forewing arising much beyond cubital fork; hindwing not broadened at hind margin. Legs : black except femora yellowish. Abdomen : in males dorsally yellowish with black streaks laterally; in females abdomen blackish.

Material examined : 2 (♀♀) & 1 ex. (without abdomen) : India, West Bengal, Darjeeling, Rongpo Rest House, 31.v.1974, Bijanbari Tea estate (coll. J.K. Jonathan and party); Arunachal Pradesh, Tirap district, Namdapha gibbon land, 30.iv.1981 (coll. S. Biswas and party).

Distribution : India (West Bengal : Darjeeling; Arunachal Pradesh).

Genus 57. ***Suphalomitus*** Weele

1909. *Suphalomitus* Weele, *Cat. Coll. Selys*, **8** : 181.

1988. *Suphalomitus*, Ghosh, *Rec. zool. Surv. India*, **85**(2) : 173.

Type species : *Suphalomitus verbosus* (Walker)

Diagnostic characters : Body : dark grey or brown and sparsely hairy. Antenna : straight. Wings : hindwing distinctly shorter than forewing; pterostigma elongate, at least twice as long as maximum width; apex of wing angular and tongue-shaped. Leg : slender and dark. Abdomen : as long as or longer than hindwing in male, cylindrical; 1st abdominal tergite without elevation.

Distribution : Africa, Malagasy, India, Sri Lanka, the Philippines, Australia.

Key to species of the genus ***Suphalomitus***

2nd abdominal tergite without tuft of black bristles at base; pterostigma elongate; labrum and clypeus yellowish; greyish hairs between bases of antennae. ..... *verbosus* (Walker)

2nd abdominal segment with tuft of black bristles; labrum and clypeus brownish; dense blackish brown hairs between bases of antennae. ..... *brevis* Kimmins

100. ***Suphalomitus verbosus*** (Walker)

1853. *Ascalaphus verbosus* Walker, *Cat. Brit. Mus. Neur.*, p. 426.

1853. *Ascalaphus* profanus Walker, *Ibid.*, p. 428.

1871. *Helicomitus* verbosus, MacLachlan, *J. Linn. Soc.*, **11** : 262.

1871. *Helicomitus* profanus, MacLachlan, *Ibid.*, p. 262.

1908. *Suphalomitus* verbosus Weele, *Cat. Coll. Selys*, **8** : 183.

1988. *Suphalomitus* verbosus, Ghosh, *Rec. zool. Surv. India*, **85**(2) : 174.

Diagnostic characters : Labrum and clypeus : yellowish. Frons : dark brown with pale margins. Ashy hairs between antennal bases. Forewing (Pl. 27, fig. 3 & Pl. A, fig. 4) : pterostigma more elongate than *S. brevis*, brown and with 4-5 crossveins; apical field with two rows of cells. Hindwing (Pl. A, fig. 4) : shorter than forewing. Abdomen : 2nd tergite in male without a tuft of black bristles; male genitalia : apices of parameres armed with numerous acute teeth.

Material examined : 2 exs. (♂♀) : India, Sikkim, Singtam, 7.vii.1979 (coll. M. Prasad and party); Meghalaya, Shillong, Motinagar, 5.v.1973 (coll. M.S. Jyrwa).

Distribution : India (Karnataka, West Bengal, Meghalaya). Elsewhere : Sri Lanka.

Remarks : Variations in wing colouration have been dealt with by Ghosh (1988).

101. ***Suphalomitus brevis*** Kimmins

1949. *Suphalomitus brevis* Kimmins, *Ann. Mag. nat. Hist.*, (12)**2** : 15.

1988. *Suphalomitus brevis*, Ghosh, *Rec. zool. Surv. India*, **85**(2) : 174.

Diagnostic characters : Head : with dense blackish brown hairs between bases of antennae. Labrum, clypeus and frons : brownish. Antenna : scarcely reaching pterostigma; blackish brown hairs between antennal bases. Forewing (Pl. 27, fig. 4) : pterostigma short with 4-5 crossveins which are heavily margined with piceous; venation blackish. Hindwing : shorter than forewing. Abdomen : little longer than hindwing; 2nd tergite with a small tuft of blackish bristles basally; male genitalia : gonarcus form an inverted 'V'; below apical margin of gonarcus and more or less fused to it arising a pair of parameres; parameres apically granulose.

Material examined : 1 ex. (♂); India, West Bengal, Darjeeling, Gayabari, 24.vi.1971 (coll. A.R. Bhowmick and party).

Distribution : India (West Bengal : Darjeeling; Karnataka; Kerala; Tamil Nadu).

Genus 58. ***Acheron*** Lefebvre

1842. *Acheron* Lefebvre, *Guer. Mag. zool.*, **92** : 6.

1866. *Hybris* (part) Hagen, *Stettin. ent. Ztg.*, **27** : 273.

1871. *Acheron*, MacLachlan, *J. Linn. Soc.*, **11** : 265.

1908. *Acheron*, Weele, *Cat. coll. Selys*, **8** : 227.

1988. *Acheron*, Ghosh, *Rec. zool. Surv. India*, **85**(2) : 175.

Type species : *Ascalaphus trux* Walker

Diagnostic characters : Antenna : shorter than forewing; denticulate internally at base; club broadly pyrifirm. Eye : with upper division slightly larger than lower one. Thorax : elongate, dilated at middle, especially in female. Wing : tip angular; extreme base of fore-wing obliquely excised and followed by a slight dilatation, rather densely reticulated; Cu_2 confluent with 1A in both wings; pterostigma large with apical portion obliquely extended; costal area in hindwings of female somewhat dilated at base. Leg : spur of the hind tibia hardly longer than first tarsal joint. Abdomen : very long in male, much longer than wings but in female shorter; slender and laterally compressed in both sexes; appendices absent; gonopod short in males.

Distribution : China, India, Bangladesh, Bhutan, Burma, Malay.

102. ***Acheron trux*** (Walker)

1853. *Ascalaphus trux* Walker, *Cat. Brit. Mus. Neur.*, p. 432.

1853. *Ascalaphus loquax* Walker, *Ibid.*, p. 434.

1853. *Ascalaphus anticus* Walker, *Ibid.*, p. 434.

1853. *Ascalaphus longus* Walker, *Ibid.*, p. 453.

1893. *Helicomitus ctenocerus* Gerstaecker, *Mitt. Natur. Ver. Neu. Vorpomm. u. Rugen*, **15** : 101.

1908. *Acheron trux* Weele, *Cat. Coll. Selys.*, **8** : 228.

1988. *Acheron trux*, Ghosh, *Rec. zool. Surv. India*, **85**(2) : 175.

Diagnostic characters : Head : testaceous brown and thickly clothed with dark black hairs about base of antenna. Antenna : testaceous; club black; segments on the inner side with teeth at base which successively decrease in size and disappear at one third of its length. Thorax : with testaceous streaks; underside with two yellow oblique bands on either side. Legs : a testaceous spot on each hind tibia. Wings : long. Forewing : subcostal region slightly tinged with brown in male but more distinctly marked in females; pterostigma brown with 5-6 crossveins. Hindwing : shorter but not narrower than forewing. Abdomen (Pl. 26, fig. 4) : nearly as long as wings and testaceous.

Distribution : India (West Bengal : Darjeeling; Assam; Meghalaya; Mizoram and Sikkim). Elsewhere : Bhutan and Burma.

Key to the subspecies of *A. trux*

Wings subhyaline or pale brown in male; hindwing in female bright tawny except at tip; subcostal region with dark brown tinge in both sexes. ..... *A. trux loquax* (Walker)

Wings hyaline in male; hindwing in female without tawny colouration; subcostal region pale brown in both sexes. ..... *A. trux trux* (Walker)

102a. ***Acheron trux loquax*** (Walker)

1855. *Ascalaphus loquax* Walker, *Cat. Brit. Mus. Neur.*, p. 432.

1908. *Acheron trux loquax*, Weele, *Cat. Coll. Selys*, **8** : 228.

1988. *Acheron trux loquax*, Ghosh, *Rec. zool. Surv. India*, **85**(2) : 176.

Diagnostic characters : *Vide key*. Wings of male and female as in Pl. A, figs. 1 & 2.

Material examined : 16 exs. (♂♀) : India, Assam, Jamduar, 4.vi.1973; Kamrup, Mothorguri, Manas Sanctuary, 19.iii.1975 (coll. S.S. Saha); Sibsagar, date & coll. Nil;Goalpara, date & coll. Nil; upper Assam, Date & coll. Nil. Meghalaya, Shilong, Risa colony, 4.ix.1974 (coll. R. Mathur). Mizoram, Seling, 15.ix.1994 (coll. I.B.D. and party).

Distribution : India : Assam, Meghalaya, Mizoram and West Bengal.

Remarks : Ghosh (1988) provided a detailed description of the subspecies. The subspecies is for the first time recorded from Mizoram.

102b. ***Acheron trux trux*** (Walker)

1853. *Acheron trux* Walker, *Cat. Brit. Mus. Neur.*, p. 432.

1908. *Acheron trux*, Weele, *Cat. Coll. Selys*, **8** : 228.

1988. *Acheron trux trux*, Ghosh, *Rec. zool. Surv. India*, **85**(2) : 177.

Diagnostic characters : *Vide key*. Wings in male as in Pl. A, fig. 3.

Material examined : 6 exs. (♂♀) : Meghalaya, Shillong, Tura, v-vi.1917 (coll. S.W. Kemp); Maupat, 31.viii.1967 (coll. R.K. Varshney); Risa colony, 4.x.1974 (coll. R. Mathur); East Garo hills, Tasek Forest Rest House, Songsok, 5.vii.1988 (coll. R.K. Ghosh and party); Dawki, 10.v.1972 (coll. S. Biswas). West Bengal, Darjeeling, Rongpo, Andherikhola, 5.vii.1979 (coll. P. Halder and party).

Distribution : India (Assam, Meghalaya, West Bengal and Sikkim). Elsewhere : Bhutan and Burma.

Remarks : Ghosh (1988) published an account of the species along with the description of subspecies. The species is for the first time recorded from Mizoram.

Genus 59. *Ogcogaster* Westwood

1848. *Ogcogaster* Westwood, *Cabinet. Orient. Ent.*, p. 69.

1873. *Ogcogaster* MacLachlan, *J. Linn. Soc.*, **11** : 264.

1988. *Ogcogaster*, Ghosh, *Rec. zool. Surv. India*, **85**(2) : 188.

Type species : *Ascalaphus (Ogcogaster) tessellatus* Westwood

Diagnostic characters : Antenna : shorter than wings, straight and without hairs at base, club broadly capitate. Eyes : very large; upper division much larger than lower. Wings : broad, dilated at middle; branch of lower cubitus confluent with post-costa in both wings. Forewing : not appendiculate; extreme base of hind margin with an excision. Legs : spurs of hind tibia as long as first tarsal segment. Abdomen : shorter than wings and with bright markings; half the length of hindwing; appendices long, directed downwards and forcipate in male.

Distribution : India and Pakistan.

Remarks : Westwood (1848) considered *Ogcogaster* as a subgenus under the genus *Ascalaphus*. But Hagen (1866), Brauer (1868), MacLachlan (1873b), Weele (1908), Ghosh (1988) treated *Ogcogaster* as a valid genus. Amongst a total of four species known so far, only one is dealt with here.

*103. *Ogcogaster tesselata* (Westwood)

1848. *Ascalaphus (Ogcogaster) tesselatus* Westwood, *Cabinet Orient. ent.*, p. 69.

1908. *Ogcogaster tesselata*, Weele, *Cat. Coll. Selys*, **8** : 253.

1929. *Helicomitus xavierii* Navas, *Rev. Acad. Cienc., Zaragoza*, **13** : 34.

1988. *Ogcogaster tesselata*, Ghosh, *Rec. zool. Surv. India*, **85**(2) : 188.

Diagnostic characters : Antenna : yellow or red brown. Vertex : with dark hairs. Thorax : dark brown with one yellow longitudinal mark at middle; scutellum light yellow. Wings : short and broad with obtuse apex; pterostigma black, longer than high with 5 crossveins; apical field with two rows of cells; dark brown mark below pterostigma; both wings with dark spot over apical portion of upper cubitus. Hindwing : with a round spot at disc between branches of radial sector. Abdomen : in female shorter, upper side yellow; lateral and apical margin dark brown.

Distribution : India (North-East; Western Himalayas including Himachal Pradesh; Gujarat; Bihar). Elsewhere : Pakistan.

Remarks : Navas (1929) described the species, *Helicomitus xavierii* on the basis of a female specimen from North-East India. Kimmins (1949b) while working on the Ascalaphidae in the British Museum Collection opines. "The figure of wings and description suggests that this species is a synonym of *Ogcogaster tesselata* Westwood." So, the occurance of *O. tesselata* in N.E. India is confirmed.

Genus 60. ***Hybris*** Lefebvre

1842. *Hybris* Lefebvre, *Guer. Mag. Zool.*, **92** : 6.

1866. *Hybris*, Hagen. *Stettin. Ent. ztg.*, **27** : 293.

1868. *Hybris*, Brauer, *Verh. zool. bot. Ges. Wien.*, **18** : 397.

1873. *Hybris*, MacLachlan, *J. Linn. Soc.*, **11** : 266.

1988. *Hybris*, Ghosh, *Rec. zool. Surv. India*, **85**(2) : 179.

Type species : *Ascalaphus javanas* Burmeister

Diagnostic characters : Antenna : as long as wing; in males basal portion bent outwardly and without teeth or hair; in female straight; club shortly but broadly pyriform, almost truncate. Eye : upper half larger than the lower one. Wing : elongate, considerably dilated at middle. Forewing : with an excision near base; axillary angle somewhat prominent. Leg : spur of hind tibia almost as long as 1st tarsal joint. Abdomen : shorter than forewing and laterally compressed in both sexes, male with appendices somewhat long, cylindrical and forcipate; sometimes shorter and somewhat spoon-shaped.

Distribution : China, India, Indonesia, Insulinde and Japan.

104. ***Hybris angulata*** (Westwood)

1848. *Ascalaphus (Ogcogaster) angulatus* Westwood, *Cabinet Oriental ent.*, : 69.

1853. *Ascalaphus angulatus* Walker, *Cat. Brit. Mus. Neur.*, : 421.

1853. *Ascalaphus accusans* Walker, *Ibid.*, : 431.

1873. *Hybris angulata* MacLachlan, *J. Linn. Soc.*, **11** : 267.

1988. *Hybris angulata*, Ghosh, *Rec. zool. Surv. India*, **85**(2) : 108.

Diagnostic characters : Vertex : yellow with black hairs. Antenna : scape and pedicel dark-brown; longer than hindwing and strongly curved at base. Pronotum : with a black stripe on either side. Mesonotum : meso-scutellum yellow; pleura dark brown with yellow stripe. Metanotum : yellow. Wings (Forewing : Pl. 27, fig. 9 & Wings : Pl. B, fig. 3) : membrane with brownish tinge specially in apical half; pterostigma dark brown with 5 crossveins; apical field with 4 rows of cells. Leg : fore-tibia with comb-like hairs at inner margin; spur of hind tibia equal to two tarsal segments taken together. Abdomen (Pl. 26, fig. 2) : tergites 1-8 yellow with black border at apex of each segment. Male genitalia (Pl. 26, fig. 3) : ectoproct forcipate, dark brown with an yellow spot at base; 9th sternite black, with two lateral protruberances and angulated at tip.

Material examined : 1 ex. (♂) : India, Meghalaya, Loharband, 3.x.1975 (coll. N. Muraleedharan and party); 3 exs., (♂♀) Mizoram Survey, 1993, Lunglei 23.ix.1993 (coll. A.R. Lahiri and party); Aibawk, 18.ix.1995, (coll. M.S. Shishodia); Aizawal, Vairengte, Saihapuikawn, 9.xii.1995 (coll. M. Sil, P. Parui and party).

Distribution : India (Assam; Meghalaya; Mizoram; West Bengal). Elsewhere : Bangladesh and Burma.

Remarks : The species is for the first time recorded from Mizoram.

Genus 61. ***Ascalaphus*** Fabricius

1775. *Ascalaphus* Fabricius, *Syst. Ent.*, p. 313.

1871. *Helicomitus* MacLachlan, *J. Linn. Soc.*, **11** : 261.

1972. *Ascalaphus*, Tjeder, *Ent. Scand.*, **3** : 153.

1988. *Ascalaphus*, Ghosh, *Rec. zool. Surv. India*, **85**(2) : 183.

Type species : *Myrmeleon barbarus* Linnaeus

Diagnostic characters : Antenna : shorter than wings; often irregularly sinuous in basal half in male; club short. Eyes : lower division shorter than upper one. Thorax : villose. Wings : appendiculate; tip rounded; apical field narrow and generally with two rows of cells; pterostigma elongate; inner margin of forewing hardly excised near base. Leg : spur of hindtibia as long as or shorter than first tarsal segment. Abdomen : shorter than hindwing : ectoproct in both sexes short.

Distribution : Africa (except the south-western and central parts of Sahara), Malagasy, Israel, India, Sri Lanka, Malay States, Sumatra, Java, the Phillipines, Japan.

Remarks : Only three species have so far been reported from North-East India which are dealt with.

Key to species of the genus ***Ascalaphus***

1. Posterior lobe of prothorax in male large with two rounded processes; mesoscutum in male with a small triangular process on either side. ..... *prothoracicus* (Kimmins)

- Posterior lobe of prothorax in male normal in size but without any process; mesoscutum in male without any process. 2

2. 4th and 5th tergite of abdomen in male without long, black setae; angle of anal lobe of forewing very much obtuse. ..... *dicax* (Walker)

- 4th and 5th tergite of abdomen in male with long, black setae; angle of anal lobe of forewing less obtuse. ..... *sinister* (Walker)

105. ***Ascalaphus prothoracicus*** (Kimmins)

1949. *Helicomitus prothoracicus* Kimmins, *Ann. Mag. nat. Hist.*, (12)**2** : 6.

1988. *Ascalaphus prothoracicus*, Ghosh, *Rec. zool. Surv. India*, **85**(2) : 184.

Diagnostic characters : Antenna : slightly shorter than hindwing; slightly arched towards base but not toothed or ciliate. Pronotum : yellow posterior lobe large, elevated in two rounded processes, each with a dense tuft of moderately long fuscous hairs in males. Supraepisternum with a small tuft of brownish setae about midway along upper margin. Wings (Forewing : Pl. 27, fig.

6 and Wings : Pl. B, fig. 2) : hyaline with brown venation; pterostigma brown with 5-6 crossveins; two rows of apical cells beyond pterostigma. Abdomen : brown; 4th tergite with a large patch of black bristles on each side in male; 9th sternite with its apical margin triangularly produced in males and in female 9th sternite with a fuscous median band tapering towards apex.

Material examined : 4 exs. (♂♀) : India, Sikkim, Rongpo river bed, 28.v.1979 (coll. M.S. Shishodia); Assam, Jamduar, 30.vi.1973 (coll. S.S. Saha and party); Meghalaya, Damalgiri, 21.iv.1991; Rangsakgiri, 1.v.1991 (coll. B.N. Das and party).

Distribution : India (West Bengal; Meghalaya; Assam; Sikkim).

Remarks : Ghosh (in press) reported this species for the first time from Meghalaya.

106. ***Ascalaphus dicax*** (Walker)

1853. *Ascalaphus dicax* Walker, *Cat. Brit. Mus. Neur.*, p. 423.

1855. *A. immotus* Walker, *Ibid.*, p. 425.

1853. *A. procax* Walker, *Ibid.*, p. 425.

1853. *A. odiosus* Walker, *Ibid.*, p. 426.

1853. *A. insimulans* Walker, *Ibid.*, p. 429.

1858. *A. cervinus* Hagen, *Verh. zool. bot. Ges. Wien.*, p. 481.

1871. *Helicomitus insimulans* MacLachlan, *J. Linn. Soc.*, **11** : 262.

1885. *Suphalasca cervinus* Gerstaecker, *Mitt. naturw. ver. Neu. Vorpom. u. Rugen*, **16** : 88.

1906. *Suphalasca placida* Weele, *Notes Leyden Mus.*, **26** : 228.

1908. *Helicomitus dicax*, Weele, *Cat. Coll. Selys.*, **8** : 178.

1988. *Ascalaphus dicax*, Ghosh, *Rec. zool. Surv. India*, **85**(2) : 186.

Diagnostic characters : Antenna : angled, slightly ciliate; reaching pterostigma of hindwing Pronotum : posterior lobe simple. Supraepisternum : upper half densely clothed with long, brown setae. Forewing (Pl. 27, fig. 7) : pterostigma yellow with 3-4 crossveins; 2 rows of apical cells beyond pterostigma; angle of anal lobe of forewing very much obtuse. Abdomen : brown dorsally, smaller than antenna, laterally black; 4th and 5th trgite in male without black setae.

Material examined : 2 exs., (♀♀) : India, Assam, Jamduar, 30.vi.1973 (coll. S.S. Saha and party); West Bengal, Darjeeling, Rajbari, 16.iv.1979 (coll. N. Pradhan).

Distribution : India (West Bengal : Darjeeling; Assam; Orissa; Himachal Pradesh). Elsewhere : Arabia; China; Indonesia; Japan; New Guinea; the Philippines; Sri Lanka.

107. ***Ascalaphus sinister*** (Walker)

1853. *Ascalaphus sinister* Walker, *Cat. Brit. Mus. Neur.*, p. 424.

1949. *Helicomitus sinister* Kimmins, *Ann. Mag. nat. Hist.*, (12)**2** : 3.

1988. *Ascalaphus sinister*, Ghosh, *Rec. zool. Surv. India*, **85**(2) : 187.

Diagnostic characters : Antenna : reaching almost pterostigma of hindwing; neither ciliate, nor serrate. Pronotum : posterior margin simple. Supraepistrnum : with a dense tuft of short brown setae along its upper edge. Wings : angles of anal lobe less obtuse than *A. dicax*. Forewing (Pl. 27, fig. 8) : pterostigma brown with 6 crossveins and two rows of apical cells beyond it. Hindwing : pterostigma with 5 crossveins. Abdomen : brown; 4th tergite very slightly swollen; 4-5 tergites with long, scattered fine black setae.

Material examined : 3 exs. (♀♀) : India, Arunachal Pradesh, Lohit, 12.x.1985 (coll. T. Sengupta); West Bengal, Darjeeling, Rongpo, 10.ix.1980 (coll. B.C. Das and party).

Distribution : India (Arunachal Pradesh; West Bengal : Darjeeling; Orissa; Bombay). Elsewhere : Sri Lanka.

Remarks : The species is for the first time recorded from Arunachal Pradesh.

Suborder II. MEGALOPTERA

Head : well developed, hypognathus. Compound eyes : large and widely separated; ocelli : three or absent. Antenna : filiform, moniliform or pectinate; many segmented. Mouth parts : biting. Prothorax : quadrate, elongate or neck-like. Wings (Pl. 28, figs. 1-2) : two pairs; held roof-like or flat over body; similar in size and structure; many veined; with or without pterostigma. Forewing : veins without fork in hind margin; Rs with little extra branching. Hindwing : usually with separated anal area (absent in Inocellidae). Legs : similar; first pair attached at base of prothorax (Inocellidae); tarsi 5-segmented. Abdomen : 10-segmented; genitalia : male either with superior or inferior appendages or both present; in Inocellidae, abdomen terminates in a hood-shaped epiproct and a pair of harpagones; female with (Inocellidae) or without ovipositor (Corydalidae).

Key to families of the suborder MEGALOPTERA

Ocelli present; prothorax quadrate; an exserted ovipositor in female wanting. ... Corydalidae

\- Ocelli absent; prothorax elongate; an exserted ovipositor present. ..... Inocellidae

Family J. CORYDALIDAE

Large sized insects, more than 60 mm in wing expanse. Head : triangular or quadrangular, with or without tooth at the sides. Antenna : moniliform or pectinate. Ocelli : present. Occiput : with a pattern either dendriform or linguiform. Wings : with not less than 3 crossveins between R_1 and Rs. Forewing : M and Cu_1 quite separate. Leg : 4th tarsal segment simple, not bilobed. Abdomen : a pair of appendices superiors present in males.

Key to genera of the family CORYDALIDAE

1. Antennae moniliform, never pectinate; head with a tooth at sides; wings with 3 or more than 3 radial crossveins between R_1 and Rs. 2

- Antennae pectinate in males but subserrate in females; head without tooth at the sides; wings with spots, at least one in costal area before pterostigma and with always 3 cross veins between R_1 and Rs. ..... *Neochauliodes* Weele

2. Forewing 1A forked twice; many crossveins between R_1 and Rs. 3

- Forewing 1A forked once; not more than three crossveins between R_1 and Rs. 4

3. Body pale; ocelli large and anterior ocellus transverse; wings with pale spots. ..... *Protohermes* Weele

- Body black; ocelli small and anterior ocellus not transverse; wings wholly black or heavily marked. ..... *Hermes* Gray

4. A distinct tooth on margin of head at the back of eyes on either side; clypeus deeply indented at middle; mandibles very large with teeth in males; some costals crossed. ..... *Acanthacorydalis* Weele

- No such tooth on head; clypeus not or slightly emarginate; mandibles not so elongate and without teeth in males; costals usually not connected. 5

5. Mandibles and antennae in males usually longer than in females; appendix inferiores in males clubbed. ..... *Corydalus* Latreille

- Mandibles and antennae in both sexes equal; appendix inferiores in males claw-like. 6

6. Body and wings dark coloured; penis long; without genital valve. ..... *Neoneuromus* Weele

- Body and wings pale yellow; penis short; with well developed genital valve. ..... *Neuromus* Rambur

Genus 62. ***Neochauliodes*** Weele

1909. *Neochauliodes* Weele, *Notes Leyden Mus.*, **30** : 259.

1910. *Neochauliodes*, *Coll. Zool. Edm. Selys. Longc.*, **8** : 60.

1940. *Neochauliodes*, Banks, *Proc. U. S. nat. Mus.*, **88** (no. 3079) : 181.

1981. *Neochauliodes*, Ghosh, *Bull. zool. Surv. India*, **4**(2) : 199.

Type species : *Neochauliodes sinensis* (Walker)

Diagnostic characters : Head : no distinct tooth at back of eye. Ocelli : large, laterals not over three diameters apart. Antenna : pectinate in male, moniliform or subserrate in female. Pronotum : as long as broad. Wings : rather broad and short, with rounded or curved tips; pattern varying from indistinct, simple, round spots to oblique bands, combined with dark, distinct points and in some cases, bands occupy nearly whole wing. Forewing : usually with 3 radial crossveins and 1A forks but once. Leg : fourth tarsal joint scarcely bilobed at tip. Abdomen : appendix superiores of male short, inconspicuous and truncated; penis simple and acute at tip.

Distribution : Bangladesh, Bhutan, China, India, Indonesia, Insulinde and Korea.

Key to species of the Genus ***Neochauliodes***

1. Hindwing costal area wholly black. ..... *obscurus* Weele
- Hindwing costal area not black. 2
2. Both wings with well-marked ante- and post-pterostigmal markings. 3
- Ante- and post pterostigmal markings very indistinct in forewing and absent in hindwing. .. .. *khasianus* (Weele)
3. Ante-pterostigmal brown streak in wings proceeding to the disc and reaching upto Cu. .... *sinensis* (Walker)
- Ante-pterostigmal brown streak not extending as above. 4
4. Forewing with vinaceous round spots from base to two thirds of its length; penis broad at base and linguiform at apex which is directed upwards. ..... *indicus* Weele
- Forewing without vinaceous round spots; penis long and slender. ..... *simplex* (Walker)

*108. *Neochauliodes obscurus* Weele

1909. *Neochauliodes obscurus* Weele, *Notes Leydon Mus.*, **30** : 262.

Diagnostic characters : Body : shining black. Antenna : black and serrate in female. Mouth parts : orange but tip of mandible black. Wings : black, humeri orange red; pterostigma cream-white; apical field with traces of light streaks in cells. Forewing : costal area with some hyaline, white spots; one or two large hyaline spots in apical field and somewhat smaller one between M & Cu. Hindwing : costal area wholly black, hyaline spot between M and Cu extending proximally upto radius; traces of light streaks in cells between Cu_2 (lower cubitus) and anal veins.

Distribution : India (Manipur).

Remarks : Although the material has not been examined but wings with orange-red humeri and wholly black costal area of hindwing as referred to in the literature are quite distinctive for the characterisation of the species.

*109. *Neochauliodes khasianus* (Weele)

1907. *Chauliodes pusillus* Weele, *Notes Leyden. Mus.*, **28** : 256.

1907. *Neochauliodes khasianus* Weele, *Notes Leyden. Mus.*, **30** : 259.

1981. *Neochauliodes khasianus*, Ghosh, *Bull. zool. Surv. India*, **4**(2) : 201.

Diagnostic characters : Body : grey-brown. Antenna : black, long, reaching beyond middle of forewing, longly pectinate on one side. Wings : ante- and post pterostigmal markings very indistinct in forewing and absent in hindwing. Forewing : costal area dark coloured and the wing spotted with numerous, indistinct greyish brown spots. Hindwing : immaculate. Both wings with three brown points between Rs and M. Male genitalia : appendices superiores long, slender and with a large basal tubercle; genital valve broad and semicircular.

Distribution : India (Meghalaya : Khasi hills).

Remarks : As the material has not been studied, it is reviewed from the literature. However, the genitalia in male and spots in forewing are quite distinctive for the species. It may also be mentioned that "Khasi hills" falls under the jurisdiction of Meghalaya not "Assam" as referred to by Weele (1907).

110. ***Neochauliodes sinensis*** (Walker)

1853. *Chauliodes sinensis* Walker, *Cat. Brit. Mus. Neur.*, **2** : 199.

1910. *Neochauliodes sinensis* Weele, *Coll. Zool. Edm. Selys Longc.*, **5**(1) : 63.

1981. *Neochauliodes sinensis*, Ghosh, *Bull. zool. Surv. India*, **4**(2) : 200.

Diagnostic characters : Body : yellow to piceous. Antenna : black, longly pectinate in male; moniliform in female. Wings : subhyaline, broad but narrow at apex. Forewing : an oblique brown streak before pterostigma proceeding to the disc and reaching upto Cu; costal area with brown dots at middle; subcostal area maculated; border at apex clouded with brown and with some large spots; brown dots between origin of M, Cu and at crossveins between them. Hindwing : costal area immaculate; spots in subcostal area much reduced; apex as in forewing. Male genitalia : genital valve semicircular and prolonged into an obtuse point; penis broad, borders slightly raised.

Material examined : 1 ex. (♂) : India, Arunachal Pradesh, Basar, 29.ix.1977 (coll. J.N. Katiyar collection).

Distribution : India (Arunachal Pradesh). Elsewhere : North, South and West China.

Remarks : Ghosh (1981d) recorded the species for the first time from India.

111. ***Neochauliodes indicus*** (Weele)

1907. *Chauliodes indicus* Weele, *Notes Leyden Mus.*, **28** : 255.

1910. *Neochauliodes indicus* Weele, *Coll. Zool. Edm. Selys Longc.*, **5**(1) : 62.

1981. *Neochauliodes indicus*, Ghosh, *Bull. zool. Surv. India*, **4**(2) : 62.

Diagnostic characters : Antenna : black, pectinate in male subserrate in female. Wings : both wings with ante- and post-pterostigmal distinct spots. Forewing : vinaceous round spots in cells from base to two thirds of its length; apical half with white spots. Hindwing : immaculate in basal half but with white spots at apical half. Male genitalia : appendix superiores strong and quadrate; genital valve small and semicircular; penis broad at base and apex, linguiform and also directed upwards.

Material examined : 1 ex. (♀) : India, Meghalaya, Shillong, Mulki, 11.viii.1973 (coll. R.S. Giri).

Distribution : India (Meghalaya; Assam; Sikkim; West Bengal : Darjeeling). Elsewhere : Bhutan.

Remarks : Ghosh (1981d) reported a female specimen of the species from Meghalaya.

112. ***Neochauliodes simplex*** (Walker)

1853. *Chauliodes simplex* Walker, *Cat. Brit. Mus. Neur.*, **2** : 200.

1910. *Neochauliodes simplex*, Weele, *Coll. Zool. Edm. Selys Longc.*, **5**(1) : 61.

1981. *Neochauliodes simplex*, Ghosh, *Bull. Zool. Surv. India*, **4**(2) : 201.

Diagnostic characters : Body (Pl. 31, fig. 3) : dull brown. Antenna : black, longly pectinate in male. Wings (Pl. 31, fig. 3) : with indistinct, small, brown points in costal field and between radial sectors; pterostigma whitish with a large brown spot on either side of it. Abdomen : apex as in Pl. 29, fig. 1. Male genitalia : penis long and slender, borders of which narrowly raised; genital valve semicircular with a linguiform prominence at tip.

Material examined : 5 exs. (♂♀) : India, Meghalaya, Shillong, Ward lake, 12.v.1959 (coll. nil); Maughlang, 20.v.1971 (coll. R.S. Pillai); Risa colony, 16.viii.1973 & 14.vii.1981 (coll. J.K. Prasad); Motinagar, 16.xi.1981 and Fruit garden, 17.vii.1982 (coll. M.S. Jyrwa).

Distribution : India (Meghalaya). Elsewhere : Bangladesh.

Remarks : Ghosh (1981d) recorded the species for the first time from India.

Genus 63. ***Protohermes*** Weele

1907. *Protohermes* Weele, *Notes Leyden Mus.*, **28** : 243.

1962. *Protohermes*, Kuwayama, *Pacific insects*, **4**(2) : 327.

Type species : *Protohermes anticus* (Walker)

Diagnostic characters : Wings : elongate with darker ground colour and typical rounded yellow spots apically. Male genitalia : appendix superiores either long and setiform or short and curved or bifurcated; tips of appendix inferiores strongly curved but neither reaching nor crossing one another; a pair of genital valves strongly developed. acutely triangular or united at base and tips reaching below other appendices; penis short.

Distribution : China, India, Indonesia, Japan, Insulinde and Taiwan.

Remarks : All the species reported from N.E. India is dealt with here. The species *montanus* is not available for study and the characters referred to in the literature are not sufficient to include the species in the following key.

Key to species of the genus ***Protohermes***

1. Appendix superiores in males bifurcated and with a tuberculum laterally at base. .... *albipennis* (Walker)

- Appendix superiores in males short and cylindrical. 2

2. Appendix inferiores in males stouter than superiores and strongly curved; genital valve forming triangular prominences. ..... *anticus* (Walker)

- Appendix inferiores in males short, claw-like and not stouter than superiores; genital valve with two divergent prominences. ..... *arunachalensis* Ghosh

113. ***Protohermes albipennis*** (Walker)

1853. *Hermes albipennis* Walker, *Cat. Brit. Mus. Neur.*, **2** : 206.

1860. *Hermes maculatus* Walker, *Trans. R. ent. Soc. Lond.*, (2)**5** : 180.

1907. *Protohermes albipennis* Weele, *Notes Leyden Mus.*, **28** : 245.

Diagnostic characters : Occiput : with two black spots. Pronotum : with black lateral lines; each one more or less divided into two spots. Mesonotum : with two round black spot. Wings (Pl. 28, fig. 1-2 & Pl. 31, fig. 1) : costal crossveins yellow; more or less connected irregular spots at middle of forewing in mature specimen; basal two-third of hindwing with yellow colour. Male genitalia (Pl. 28, fig. 3) : appendix superiores bifurcated and with a tuberculum laterally at base; genital valve consisting of two large triangular valves; appendix inferiores claw-like with dark tips.

Material examined : 2 exs. (♂♂) : India, Meghalaya, Shillong, Risa colony, 26.vi.1971 (coll. J.K. Prasad); Shillong, 7.iv.1971 (coll. S. Biswas).

Distribution : India (Meghalaya). Elsewhere : Nepal.

Remarks : Ghosh (in press) redescribed the species from Meghalaya.

114. ***Protohermes anticus*** (Walker)

1853. *Hermes anticus* Walker, *Cat. Brit. Mus. Neur.*, **2** : 205.

1853. *Hermes costalis* Walker, *Ibid.*, p. 207.

1896. *Neuromus grandis* MacLachlan, *Ann. Mag. Nat. Hist.*, (4)**4** : 45.

1896. *Neuromus infectus* MacLachlan, *Ibid.*, p. 41.

1907. *Protohermes anticus* Weele, *Notes Leyden Mus.*, **28** : 244.

Diagnostic characters : Body (Pl. 31, fig. 2) : spots more or less connected on upper side. Wings (Pl. 31, fig. 2) : membrane dark greyish-brown; yellow spots in forewing isolated; yellow base reaching upto middle in hindwing. Abdomen : apex in male as in Pl. 29, fig. 2. Male genitalia : appendix superiores short, cylindrical, nearly straight and directed inwards; appendix inferiores stouter than superiores and strongly curved; genital valve large, prolonged laterally and forming triangular prominence.

Material examined : 1 ex. (damaged) : India, Sikkim, without other data.

Distribution : India (Meghalaya : Khasi hills; West Bengal : Darjeeling; Sikkim). Elsewhere : China & Bhutan.

Remarks : The species is for the first time recorded from Sikkim.

115. ***Protohermes arunachalensis*** Ghosh

1991. *Protohermes arunachalensis* Ghosh, *Rec. zool. Surv. India,* **88**(1) : 147.

Diagnostic characters : Occiput : with 4 black spots on either side. Pronotum : broad, yellow and with two black lateral lines. Meso- and metanotum : yellow, each with two black spots. Forewing (Pl. F, fig. 3) : with more or less isolated yellow spots; veins blackish but yellow in spotted area; smoky brown patch between two costal crossveins upto pterostigma. Hindwing (Pl. F, fig. 3) : with squared black spot at apex. Male genitalia (Pl. 32, figs. 1-3) : appendix superiores short and apex with brush of hairs at inner margin; genital valve with two long divergent cylindrical prominences; appendix inferiores short, claw-like and with black tips.

Material examined : 1 ex. (♂) : India, Arunachal Pradesh, Itanagar, Chief Minister's Bungalow, 27.iv.1987 (coll. C.B. Prasad).

Distribution : India (Arunachal Pradesh).

Remarks : Ghosh (1991) described the species from Arunachal Pradesh.

*116. ***Protohermes montanus*** (MacLachlan)

1869. *Neuromus montanus* MacLachlan, *Ann. Mag. nat. Hist.*, (4)**4** : 42.

1907. *Protohermes montanus* Weele, *Notes Leyden Mus.*, **28** : 247.

Diagnostic characters : Head : small with sharp teeth at posterior angles. Antenna : very slender and black. Pronotum : longer than broad and greyish fuscous. Wings : whitish, straw-coloured. Venation : yellowish but costal, discal and base of one of the cubital crossveins fuscous.

Distribution : India (Sikkim).

Remarks : As the species is not available for study it is reviewed from the literature. Weele (1910) transferred the species to *Protohermes*. But he stated that examination of more material of the species from the type locality is needed for settling the placement of the species in a proper genus. In view of the comment, study of the species is essential to accommodate it in proper genus.

Genus 64. ***Hermes*** Gray

1832. *Hermes Gray, In Cuvier's Animal Kingdom, Ed. Griffith,* **11** : 331.

1906. *Hermes*, Weele, *Notes Leyden, Mus.*, **16** : 208.

1910. *Hermes*, Weele, *Coll. Zool. Edm. Selys Longc.*, **5**(1) : 40.

Type species : *Hermes maculipennis* Gray

Diagnostic characters : Body : black. Occiput : with linguiform markings. Pronotum : orange (in some species with blackspots or wholly black). Wings : broader at base and more pointed towards apex; blackish brown; yellow markings relatively smaller; round spot in apical half very distinct. Male genitalia : appendix superiores short, furcated, branches forming an obtuse angle, lower branch longer than upper.

Distribution : India to Tonkin; Sumatra; Java; Borneo.

Remarks : Amongst three species of the genus two have been reviewed from the literature and the key to species has been prepared accordingly.

Key to species of the genus ***Hermes***

1. Costal veins of forewing yellow marginated. Large and robust species.... *costastriata* Weele
- Not as above.....2
2. Pronotum orange in both sexes; hindwing basal spot large. ..... *maculipennis* Gray
- Pronotum black in female but light orange in male; hindwing basal spot very small. .... *selysi* Weele

*117. ***Hermes costastriata*** Weele

1907. *Hermes costastriata* Weele, *Notes Leyden Mus.*, **28** : 249.

Diagnostic characters : Large and robust. Head : very broad, nearly quadrate. Pronotum : orange coloured and with four black spots. Forewing : with costal veins yellow-marginated. Hindwing : with a basal spot. Male genitalia : appendix superiores with unequal branches, lower branch longer than upper and its apex inwardly curved; appendix inferiores claw-shaped and curved inwards; genital valve composed of two separated triangular valves.

Distribution : India (Meghalaya : Khasi Hills).

Remarks : The species is not available for study so it is reviewed from the literature.

118. ***Hermes maculipennis*** Gray

1832. *Hermes maculipennis* Gray, *In Cuvier's Animal Kingdom, Ed. Griffith*, **11** : 331.

1842. *Neuromus ruficollis* Rambur, *Hist. Nat. Neuropt.*, p. 443.

1869. *Chauliodes maculipennis* MacLachlan, *Ann. Mag. nat. Hist.*, (4)**4** : 39.

1903. *Neuromus maculipennis* Davis, *Bull. New York State Mus.*, **68** : 648.

1909. *Neuromus maculipennis*, Needham, *Rec. Indian Mus.*, **9** : 195.

1910. *Hermes maculipennis* Weele, *Coll. Zool. Edm. Selys Longc.*, **5**(1) : 41.

Diagnostic characters : Body : black. Pronotum : orange without dark spots. Wings : blackish brown with many small cream-white spots. Forewing : basal spot at hind border connected with

other spots but never touching front border. Hindwing : larger basal spot extending between front and hind border; small, round spots beyond basal spot towards apex. Male genitalia : appendix superiores bifurcated, lower branch longer; appendix inferiores consisting of a curved thick basal joint and an upwardly directed setiform one; genital valve corneous, long, slightly curved with obtuse tip; penis consisiting of two isolated black, finger shaped processes with hairy tip articulated dorsalwards with a claw-like chitin piece lying in the soft membrane between appendix superiores and inferiores.

Material examined : 1 ex. (damaged) : India, North Khasi hills, Regd. No. 9788/15, no other data.

Distribution : India (Meghalaya). Elsewhere : Java and Borneo.

*119. ***Hermes selysi*** Weele

1909. *Hermes selysi* Weele, *Notes Leyden Mus.*, **30** : 256.

Diagnostic characters : Small in size. Pronotum : black in female but light orange in male. Forewing : spots very small, point-like; with small apical spots. Hindwing : basal spot very small, trapeziform; the spot reaching about middle of anal border and not connected with other spot.

Distribution : India (Meghalaya : Khasi Hills). Elsewhere : Bangladesh (Sylhet).

Remarks : The species has been reviewed from literature as no specimen is available for study.

Genus 65. ***Acanthacorydalis*** Weele

1907. *Acanthacorydalis* Weele, *Notes Leyden Mus.*, **28** : 228.

1908. *Acanthacorydalis*, Banks, *Proc. ent. Soc. Wash.*, **10** : 29.

Type species : *Corydalus asiatica* Wood-Mason

Diagnostic characters : Body : dark brown. Head : broad, quadrangular with a distinct dent on each side. Eye : hemispherical and brown. Ocelli : 3, distinct. Mandible : in males greatly elongated, curved, about twice as long as head, having a minute tooth near apex on inner side; in females only about as long as head; 3-toothed on inner side of distal half. Occiput : with a tooth on each side. Antenna : simple and setaceous. Prothorax : longer than broad. Meso- and metathorax : broad. Wing : subhyaline; elongate; anterior margin brown, specially in forewing. Leg : long and stout. Abdomen : shorter than wing. Male genitalia : with a pair of long appendix superiores and a pair of short appendix inferiores.

Distribution : India and China.

Remarks : Three species have so far been reported from India and all are being dealt with here. But as the literature and the material are not available for study, *A. horrenda* Navas has not been included in the key to species.

Key to species of the genus ***Acanthacorydalis***

Antenna simple and setaceous; head with a minute spinule on either side. .... *asiatica* (Wood-Mason)

- Antenna submoniliform; head with a broad triangular tooth on either side. .... *orientalis* (MacLachlan)

120. ***Acanthacorydalis asiatica*** (Wood-Mason)

1884. *Corydalis asiatica* Wood-Mason, *Proc. Zool. Soc. Lond.*, p. 110.

1907. *Acanthacorydalis asiatica* Weele, *Notes Leyden Mus.*, **28** : 228.

Diagnostic characters : Head and thorax symmetrically marked with brown or black. Antenna : simple and setaceous. Head : with a pair of minute spinules just internal to lateral pair of ocelli. Mandibles : coal-black with a shallow rounded emergination on inner side at base; with a minute tooth at apex in males but with three teeth in female on the inner side of distal half. Pronotum and Metanotum : brown at middle but black on either side. Mesonotum : black. Wings : smoky, more darker at anterior margin. Forewing : with a few discal blotches more pronounced between R & Rs; crossveins before middle of wing clouded with brown. Legs : black. Anal appendages : short and stout.

Measurements : Male : Length of forewing, 74 mm; of hindwing, 60 mm. Female : Length of forewing, 68 mm; of hindwing, 60 mm.

Material examined : 2 exs. (♂ ♀ Types) : India, Nagaland, date : Nil, (Coll. Ogle).

Distribution : India (Nagaland).

Remarks : Wood-Mason (1884) while describing the species indicated both male and female specimens as types. After studying the types at National Zoological Collections, Zoological Survey of India, some morphological characters of thorax, wings and legs along with measurements of wings have been included.

*121. ***Acanthacorydalis orientalis*** (MacLachlan)

1899. *Corydalis orientalis* MacLachlan, *Trans. ent. Soc. Lond.*, 1899 : 281.

1910. *Acanthacorydalis orientalis* Weele, *Coll. Zool. Edm. Selys Longc.*, **5**(1) : 22.

Diagnostic characters : Head : large, subquadrate; posterior angles produced into a very strong, black, acute triangular tooth; a broad black, triangular tooth on either side of convex disc portion of the head. Mandible : with 3 tooth, black. Antenna : submoniliform, black. Pronotum : with a median yellowish longitudinal stripe and irregular longitudinal lines on either side. Meso- and metanotum : black; scutellum and anterior lobe of mesothorax marked yellowish. Wings : smoky, cinereous. Forewing : with a few paler spaces on the disc; all crossveins margined with black but broadly margined at base; black or blackish spots below radius and in the basal portion of Cu. Hindwing : similar to forewing but crossveins margined with black only at apex. Male

genitalia : appendices superiores strong, slightly curved inwards; inferior appendages geniculated with apical portion curved inward.

Distribution : India (Nagaland : Naga Hills). Elsewhere : Western China.

Remarks : The species differs from *A. asiatica* Wood-Mason in the structure of head, thorax and mandibles and wing markings.

*122. ***Acanthacorydalis horrenda*** Navas

1931. *Acanthacorydalis horrenda* Navas, *Rev. Acad. Cienc. Madrid,* **26** : 73.

Distribution : India (Nagaland : Naga Hills).

Remarks : Due to the paucity of the material for examination and the non-availability of literature, the author reserves his comment on the species.

Genus 66. ***Corydalus*** Latreille

1802. *Corydalus* Latreille, *Hist. nat. Crus. et. Ins.* **3** : 290.

1804. *Corydalus* Latreille, *Ibid.*, : 44.

Type species : *Corydalus cornutus* (Linn.)

Diagnostic characters : General colour : luteus to luteofuscous. Head : broad, flat, nearly quadrangular and with distinct dent at each side. Eye : large, brown and hemispherical. Ocelli : 3, distinct. Mandible : large, not concealed by labrum, elongated, curved or straight and without any denticulations in males but always denticulate in females. Antenna : moniliform usually longer in males. Prothorax : narrow, shorter than head, somewhat larger than broad with more or less luteous markings or unicolourous. Meso- and metathorax : broad and robust. Wings : elongate, large, equal in size and form, brownish grey with white spots and with numerous crossveins. Leg : long and robust, nearly unicolorous and with short pubescence. Abdomen : shorter than wings, robust. Male genitalia : gonopod with a pair of long appendix superiores and with clubshapped appendix inferiores; genital valve quadrangular; penis chitinised, elongated or with two lateral prominences; tuberculum situated on the border of last tergite. Female genitalia : appendices superiores short and inconspicuous, genital valve also short.

Distribution : America, China and India.

Remarks : Weele (1910) opined that the name of the Genus *Corydalis* should be used as *Corydalus*. He stated, "It is moreover a homonym of a genus of plants, so it is legitimate to use the name *Corydalus* than *Corydalis*".

123. ***Corydalus territans*** Needham

1909. *Corydalis territans* Needham, *Rec. Indian Mus.*, **3** : 193.

1991. *Corydalis territans*, Ghosh, *Rec. zool. surv. India*, **88**(1) : 148.

Diagnostic characters : Head and body : robust. Head : rufous, rugose; lateral margin minutely serrulate on its flaring border which is produced behind into a sharp spine and ending anteriorly into a thin, flat, triangular projection behind eye. Vertex : elevated, rim at inner side of antenna edged with black. Ocelli : 3, closely set and edged with black. Frons : anterior rim with deep invagination at middle and indented laterally. Mandibles : long, nearly as long as head and with tips crossed. Pronotum : with a long black stripe on each side and also with a transverse stripe anteriorly. Meso- and metanotum : bright yellow at middle and reddish fulvous on either side of it. Forewing (Pl. F. fig. 1) : costal space narrowed at region of pterostigma; with hyaline spots - 4 spots between R and first fork of Rs, 3 spots between Rs and media, one between branches of media, 4 between cubitus and media and 4 between cubitus and anal. Hindwing (Pl. F, fig. 1) : very few hyaline spots between R & Rs and branches of Rs. Legs : rufous beneath and at base; blackish dorsally and towards apex. Abdomen : reddish fulvous; genitalia in male as in Pl. 32, figs. 4-5.

Measurements : Male, length of forwing, 62 mm; hindwing, 55 mm.

Material examined : 1 Male : India, Sikkim, Dentam, no other data available.

Distribution : India : Sikkim.

Remarks : The species was described by Needham (1909) from Sikkim based on a single female specimen. Ghosh (1991) recorded male from India.

Genus 67. ***Neoneuromus*** Weele

1909. *Neoneuromus* Weele, *Notes Leyden Mus.*, **30** : 252.

1910. *Neoneuromus* : Weele, *Coll. Zool. Edm. Selys Longc*, **5** : 24.

Type species : *Neuromus fenestralis* MacLachlan

Diagnostic characters : Body : dark coloured. Head : broad; dorsoventrally compressed about twice as broad as prothorax; with acute teeth on each side behind eyes. Mandibles and antennae : equal in both sexes. Occiput : without tooth. Wing : dark coloured; no pale spots on membrane of wings. Abdomen : appendix superiores of male clubbed at apex; genital valve absent; penis developed into a very long obtusely pointed plate, of which tip projecting between superior appendices; appendix inferiores of male claw-like.

Distribution : India and China.

Remarks : Altogether three species from N.E. India are dealt herewith.

Key to species of the genus ***Neoneuromus***

1. Pronotum with a narrow black streak on either side; appendix inferiores in males two jointed. 2

- Pronotum broadly black laterally; appendix inferiores in males three jointed..... .....*fenestralis* (MacLachlan)

2. Pronotum lateral streaks uninterrupted at middle; with a black lunule on the outer side of each lateral streak of pronotum..... *latratus* (MacLachlan)

- Pronotum lateral streaks interrupted at middle and without black lunule as above. .... *sikkimensis* (Weele)

124. ***Neoneuromus fenestralis*** (MacLachlan)

1869. *Neuromus fenestralis* MacLachlan, *Ann. Mag. nat. Hist.*, (4)**4** : 42.

1907. *Neoneuromus fenestralis*, Weele, *Notes Leyden Mus.*, **28** : 241.

Diagnostic characters : Body : reddish brown. Head : broad, wth an acute teeth on either side posteriorly. Antenna : black. Pronotum : longer than broad, broadly black laterally. Wings : smoky brown; forewing darker than hindwing, region of pterostigma smoky brown, costal crossveins black; cells between R and Rs with hyaline spot; three hyaline spots in three hyaline cells between Rs, M and Cu_1 and parallel with it some narrow spots towards hind border. Male genitalia : appendix superiores incurved at tip; appendix inferiores three jointed, last joint claw-shaped, acute and curved inwards abruptly; penis long, flattened, acuminate and truncate at apex, ventrally with two, long, shallow impressions.

Remarks : The nomino-typical subspecies is dealt with here.

*124(a) ***Neoneuromus fenestralis fenestralis*** (MacLachlan)

1910. *Neoneuromus fenestralis fenestralis* Weele, *Coll. Zool. Edm. Selys Longc.*, **5**(1) : 26.

Diagnostic characters : Size : large. Wings : longer and narrower than others; some cells smoky brown with hyaline spots.

Distribution : India (West Bengal : Darjeeling; Sikkim).

Remarks : Weele (1910) described this nomino-typical subspecies.

125. ***Neoneuromus latratus*** (MacLachlan)

1869. *Neuromus latratus* MacLachlan, *Ann. Mag. nat. Hist.*, (4)**4** : 43.

Diagnostic characters : Body : red brown. Head : black dent on either side posteriorly. Antenna : black. Pronotum : longer than broad; with a narrow black streak on either side; a black lunule anteriorly on outer side of each streak. Wings : light smoky brown but hind pair paler than forewing; longitudinal veins yellow; majority of crossveins black. Male genitalia : appendix superiores curved, thickened at apex; appendix inferiores long, two jointed, second joint abruptly curved inward in the form of an acute claw which is with black tip; penis long, flat and obtusely furcated at apex.

Remarks : Nomino-typical subspecies *N. latratus latratus* is dealt with here.

125(a) ***Neoneuromus latratus latratus*** (MacLachlan)

1910. *Neoneuromus latratus latratus* Weele, *Coll. Zool. Edm. Selys Longc.*, **5**(1) : 26.

1991. *Neoneuromus latratus latratus*, Ghosh, *Rec. zool. Surv. India*, **88**(1) : 148.

Diagnostic characters : Body (Pl. 30, fig. 1).: colour black. Wings (Pl. 30, fig.1) : hyaline spots comparatively larger between Rs and Cu; minute hyaline spots in apical parts. Male genitalia (Pl. 30, figs. 2-3) : appendix superiores more curved to one another and more thickened but without incurvation at tip. Abdomen : apex of female abdomen as in Pl. 30, fig. 4.

Material examined : 2 exs. (♀♀) : India, Meghalaya, Khasi Hills, Shilong, Police Bazar, 5.viii.1965 (Coll. B.K. Tikader); 1 ex. (♀), Ward Lake, 29.vii.1973 (Coll. K. Deb).

Distribution : India (Meghalaya).

Remarks : Ghosh (1991) reported the subspecies from Meghalaya and included the figures of male genitalia.

*126. ***Neoneuromus sikkimensis*** (Weele)

1907. *Neuromus sikkimensis* Weele, *Notes Leyden Mus.*, **28** : 237.

1910. *Neoneuromus sikkimensis* Weele, *Coll. Zool. Edm. Selys Longc.*, **5**(1) : 24.

Diagnostic characters : Head : broad, yellow. Antenna : black. Pronotum : with a narrow black streak on either side which is interrupted at middle. Wings : smoky-brown. Forewing : costa black, costal crossveins dark brown to black. Hindwing : costa and costal veins dark brown. Abdomen : apex in male as in Pl. 29, fig. 3. Male genitalia : appendix superiores enlarged at apex; appendix inferiores with second segment claw-shaped and abruptly curved inward; penis well-developed and slightly sulcated at apex.

Distribution : India (Sikkim).

Remarks : Due to the paucity of the material for study, the species has been reviewed from literature.

Genus 68. ***Neuromus*** Rambur

1842. *Neuromus* Rambur, *Hist. nat. Neurop.*, p. 441.

1907. *Neuromus*, Weele, *Notes Leyden Mus.*, **28** : 235.

Type species : *Neuromus testaceus* Rambur

Diagnostic characters : Body : pale yellow. Head : a distinct tooth on margin at back of eyes; with ocelli. Mouth parts : clypeus slightly emarginate; mandibles equal in both sexes and not much elongate. Pronotum : as long as broad. Wings : pale yellow; wing membrane not punctate,

with pale dots; costals usually not connected; 1A forked once only. Leg : fourth tarsal segment scarcely bilobed. Male genitalia : appendix inferiores claw-like; appendix superiores not clubbed at apex; genital valve well developed; penis short.

Distribution : India; Borneo; Sumatra.

Remarks : One species of the genus have so far been reported from North East India which is dealt with here.

127. ***Neuromus decemmaculatus*** (Walker)

1858. *Hermes decemmaculatus* Walker, *Trans, R. Ent. Soc. Lond.*, (2)**5** : 180.

1909. *Neuromus decemmaculatus*, Needham, *Rec. Indian Mus., 3* : 194.

Diagnostic characters : Head : broader than pronotum; slightly angular on each side; with an elongate spot on either side posteriorly. Antenna : black, serrated. Pronotum : with two elongated black spots on either side; contracted at middle. Meso- and metanotum : little broader but much shorter than pronotum.Wings : whitish hyaline; veins testaceous.

Material examined : 3 exs. (♂♀) : India, Meghalaya, Khasi Hills (coll. N. Annandale & Godwin-Austen); Shillong, 20.x.1960 (coll. T.G. Vazirani).

Distribution : India (Meghalaya : North Khasi Hills).

Family K. INOCELLIDAE

Diagnostic characters : Head : large. Ocelli : absent, but three tubercles quite prominent. Antenna : filiform, multisegmented. Labial palpus : setaceous, 3 segmented. Maxillary palpus : 5 segmented. Mandible : toothed within. Prothorax : long, slender; sides not covering prosternum which basally bearing fore legs. Meso- and metathorax : together a little longer than prothorax. Wing : hyaline; a little longer than body. Forewing : costal area more or less dilated; costal veinlets simple; Sc joining c before pterostigma; R_1 running parallel with Sc; R_1 connected with Sc by two cross veins, of which one present at base and other near the point where Sc joining costa; pterostigma large but without veinlets. Hindwing : costa less inflated; costal area less dilated; space between Sc and R_1 narrow; R_1 connected with Sc by one crossvein, anal space very little developed. Leg : hind leg little longer than others; tarsus with 1st joint long; 3rd tarsal segment concealing 4th which is short. Abdomen : slender; female with long ovipositor.

Genus 69. ***Inocellia*** Schneider

1843. *Inocellia* Schneider, *Monografia generis Rhaphidiae Linnaei*. Typies officinee Grassii, Barthi et Socii, Vratislaviae : 32.

Type species : *Raphidia crassicornis* Schummel

Diagnostic characters : Ocelli : absent but with three prominent tubercles. Mandible : toothed within. Wings : little longer than body. Forewing : costal area more or less dilated; costal veinlets

simple; Sc joining c before pterostigma; R_1 connected with Sc by a single crossvein at base and other near the point where Sc joining c; pterostigma large but without veinlets. Hindwing : R_1 connected with Sc by a single crossvein. Leg : third tarsal segment of hind leg concealing short fourth segment. Abdomen : female with long ovipositor.

Distribution : Africa, Burma, China, Europe, India, Mexico and Turkey.

Remarks : A species is so far reported from India which is dealt with.

Subgenus ***Inocellia***

Diagnostic characters : as for the genus.

128. ***Inocellia (Inocellia) crassicornis*** (Schummel)

1832. *Raphidia crassicornis* Schummel, *Versuch* : 15.

1843. *Inocellia crassicornis* Schneider, *Monographia generis Rhaphidiae Linnaei*, Typis Officinee Grassii, Barthi et Socii, Vratislaviae : 89.

Redescription : Vertex : about as long as prothorax with sides parallel. Occiput : narrow. Frons, clypeus, labrum, mandibles and maxillae : black. Thorax : devoid of hairs. Pronotum : black, shiny with sides elongated, parallel and anteriorly rounded. Meso- and metanotum : black and shiny. Forewing (Pl. 33, fig. 1) : narrowed at base, then abruptly widened and again narrowed down near dark brown pterostigma where it unites with Sc; costal margin with short black hairs; 7 costal crossveins before pterostigma and 3 cells beyond it; two crossveins between Sc and R_1; 3 cells between R_1 and Rs; a large cell formed in the middle of the wing by the union of M and Cu_1; two crossveins between Cu_1 and Cu_2; 1A connected to 2A by a crossvein and forming a large cell; all the marginal veins simple, a forked one at apex. Hindwing (Pl. 33, fig. 2) : shorter than forewing; 1 crossvein between Sc and R_1; 1st branch of M connected with Cu_1; crossvein between Cu_1 and Cu_2 and another one between Cu_2 and 1A. Leg : coxae and femora yellow; tibiae and tarsi brown; last but one segment of the tarsi flattened and extended on two sides; last segment with brown claws. Abdomen : black and shiny; tip of abdomen in male as in Pl. 33, fig. 3.

Measurement : 1 male : length of forewing, 10 mm; of hindwing, 8.5 mm.

Material examined : 1 male : India : Meghalaya : Shillong insectary, 27.v.92 (coll. K. Dev).

Distribution : India : Meghalaya. Elsewhere : Europe, Japan and Siberia.

Remarks : The species is for the first time recorded from India.

ECONOMIC IMPORTANCE OF THE GROUP

The order Neuroptera includes many species which are predacious on different insect pests in their larval and adult stages and are valuable allies of man. The Chrysopids are the most

economically important group of Neuroptera. The larvae of all species and the adults of few are predaceous and feed on aphids, coccids, psyllids, and other soft bodied insects which they encounter on foliage. For this reason, some species are being deployed for the biological control of agri-horticultural pests. Chrysopids are now being used in India for suppression of pests of cotton, sunflower, ground nut and some fruit crops in many parts of the country and large scale production of Chrysopids for demonstration of effectiveness in controlling a variety of crop pests, is already underway (Singh & Jalali 1991). The larvae of brown lacewings (fam. Hemerobiidae) are strictly predaceous but the adults, though principally predaceous, are reported to feed on honey. All the species inhabit in their larval and adult stages on the surfaces of vegetations upon which their preys namely, aphids, coccids are found. The larvae and adults of Coniopterygidae also feed upon coccids, aphids, psyllids, mites etc. So, Muma (1967) considered coniopterygids as important biological control agents of white flies and citrus mites. Tjeder (1957) stated, "It is assured that atleast some of the species will prove to be a great value in the biological control of pests specially scalepests on wattles, citrus trees and others". Besides being predators, a few neutropterans are parasitic in habit in that they parasitize the egg capsules of spiders (Fam. Mantispidae). The feeding habits of other Planipennia like Dilaridae, Berothidae, Myrmeleontidae, Ascalaphidae are poorly known from India. But from the records, it is known that Myrmeleontidae larvae depend on the respective insect victims like ants. The immature forms of some Megaloptera like Corydalids and Inocellids prey upon the aquatic larvae of various groups of other animals.

In view of the foregone facts, Neuroptera, in general, exhibits carnivorous habits and thus offers a better scope for deploying some of these insects in biological control measure.

GEOGRAPHICAL DISTRIBUTION AND SEASONAL OCCURENCE

From consideration of the distribution of the species on worldwide basis, it appears that to a great extent there is infiltration of Indo-Chinese elements. Moreover, the resemblance of the North-East Indian fauna with the Indo-Malayan, Palaearctic, Ethiopian, Hawaiian and Papuan fauna is evident from the distributional data given under each species. The approximate number of endemic genera and species in India stands at 10% and 78% respectively of which 41% of the species are endemic in North-East India. The endemicity can probably be explained by the richness of flora brought about by the climatic factors which are highly variable when considered in terms of altitudinal variation. Such richness of the flora evidently invites a large number of insects and other organisms on which these neuropteran insects predate. The collection data provided under each species show that majority of insects are found in spring-summer season before monsoon and autumn to early winter season after monsoon. These periods coincide with lush vegetation attracting a large number of insect pests. The foregone account justifies the contention that preponderance of the neuropteran fauna in a particular area is correlated with a peak abundance of the pest-species.

SUMMARY

The paper deals with a comprehensive account of the neuropteran fauna of North-East India. The systematic account of the neuropteran fauna has brought to light the existence of 128 species in 69 genera and 11 families under the two suborders, Megaloptera and Planipennia. Out of these 128 species, material of 88 species could be examined and the rest have been reviewed from literature as even with best efforts, it was not possible to have a glimpse of the species.

Amongst a total of 88 species examined, *Spilosmylus darjeelingensis* has been described as new to science and female of *Parosmylus belaae* Ghosh (Fam. Osmylidae), *Hemerobius harmandinus* Navas, *Hemerobius humulinus* Linnaeus and *Neuronema nepalensis* Nakahara (Fam. Hemerobiidae); *Retipennia hasegawai* (Nakahara) [Fam. Chrysopidae]; *Hagenomyia nigrinus* (Esben-Petersen) and *Indoclystus singularis* (Westwood) [Fam. Myrmeleontidae] and *Inocellia crassicornis* (Schummel) [Fam. Inocellidae] have been recorded for the first time from India. Besides, *Hagenomyia eurystictus* (Gerstaecker), *Hagenomyia marginicollis* (Gerstaecker), *Hagenomyia nigrinus* (Esben-Petersen) from the examined material and *Distoleon bivittatum* Banks [Fam. Myrmeleontidae] from literature have been newly combined. For 41 species and subspecies, new localities have been added to the previously recorded localities. *Parosmylus belae* Ghosh (♀), *Thyridosmylus perspicillaris fenestratus* Kimmins (Fam. Osmylidae), *Indoclystus singularis* (Westwood) [Fam. Myrmeleontidae] and *Inocellia crassicornis* (Schummel) [Fam. Inocellidae] have been redescribed.

In addition to systematic account, external morphology and terminology of Neuroptera, historical resume, topography, climate and vegetation of North-East India, classification, economic importance of the group, geographical distribution and seasonal occurrence of Neuroptera have been included. Running keys to all the taxa examined, illustrations pertaining to majority of species and relevant references have also been provided.

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Table showing distribution of species of Neuroptera in North-East India

Name of the species	Arunachal Pradesh	Nagaland	Manipur	Mizoram	Tripura	Meghalaya	Assam	West Bengal (Darjeeling)	Sikkim
1	2	3	4	5	6	7	8	9	10
Family CONIOPTERYGIDAE									
1. *Coniopteryx ambigua* Withycombe						+	+		
2. *C. exigua* Withycombe						+			
3. *Conwentzia inverta* Withycombe						+			
4. *Heteroconis terminalis* Withycombe						+			
5. *Coniocompsa indica* Withycombe						+			
Family MANTISPIDAE									
6. *Climaciella quadrituberculata* (Westwood)							+	+	
7. *Mantispa nodosa* Westwood						+	+		
8. *Mantispa indica* Westwood						+	+	+	+Δ
9. *Mantispa rugicollis* Navas							+		+
Family HEMEROBIIDAE									
*10. *Drepanacra khasiana* (Kimmins)						+			
11. *Psectra iniqua* (Hagen)								+Δ	
•12. *Hemerobius harmandinus* Navas						+Δ			
•13. *H. humulinus* Linnaeus						+Δ			
14. *Micromus timidus* Hagen				+Δ	+Δ				+Δ
15. *Micromus kapuri* (Nakahara)							+		
16. *Micromus linearis* Hagen			+Δ	+Δ		+		+	+
17. *Micromus calidus* Hagen				+Δ		+		+	
•18. *Neuronema nepalensis* Nakahara									+Δ
*19. *Neuronema assamensis* Kimmins						+			
*20. *Neuronema decisum* (Walker)								+	
21. *Neomicromus agarwalai* Ghosh					+				
Family DILARIDAE									
22. *Dilar hornei* MacLachlan								+	
Family OSMYLIDAE									
23. *Hyposmylus punctipennis* (Walker)						+			+Δ

1	2	3	4	5	6	7	8	9	10
*24. *Mesosmylus naevius* (Navas)							+		+
•25. *Parosmylus belaae* Ghosh (Female)	+Δ								+Δ
*26. *Heterosmylus aspersus* Krüger									+
*27. *Gryposmylus pubicosta* (Walker)							+		
28. *Spilosmylus tuberculatus* (Walker)							+		
29. *Spilosmylus darjeelingensis* sp. nov.								+	
30. *Spilosmylus conspersus* (Walker)								+	
*31. *Thyridosmylus pastulatus* Kimmins						+			
32. *Thyridosmylus langii* MacLachlan						+		+	
*32a. *Thyridosmylus langii angustus* Kimmins						+			
33. *T. perspicillaris* (Gerst.)									+
33a. *T. p. minor* Kimmins									+
33b. *T. p. fenestratus* Kimmins									+Δ
Family BEROTHIDAE									
*34. *Berotha insolita* Walker	+					+			
Family CHRYSOPIDAE									
35. *Ankylopteryx octopunctata* (Fabricius)						+		+	
36. *Ankylopteryx tesselatus* Needham							+		
37. *Tumeochrysa indica* Needham			+						
*38. *Tumeochrysa cirerai* (Navas)									+
39. *Chrysopidia (A.) garhwalensis* Ghosh	+Δ							+	
*40. *Chrysopidia (C.) numerosa* Navas								+	
41. *Chrysopidia (C.) nigrata* Navas			+Δ					+	+Δ
*42. *Chrysopidia (C.) fuscata* Navas								+	
43. *Chrysopidia (C.) manipurensis* Ghosh			+						
*44. *Stigmachrysa cladostigma* (Navas)									+
45. *Italochrysa robusta* (Needham)							+		
*46. *Italochrysa carletoni* (Banks)									+
*47. *Italochrysa lefroyi* (Needham)						+	+		
48. *Italochrysa flavobrunnea* Ghosh						+Δ			
*49. *Italochrysa stitzi* (Navas)									+
*50. *Italochrysa talaverae* (Navas)									+
⊗51. *Italochrysa* sp. 1.				+					
52. *Italochrysa* sp. 2.								+	

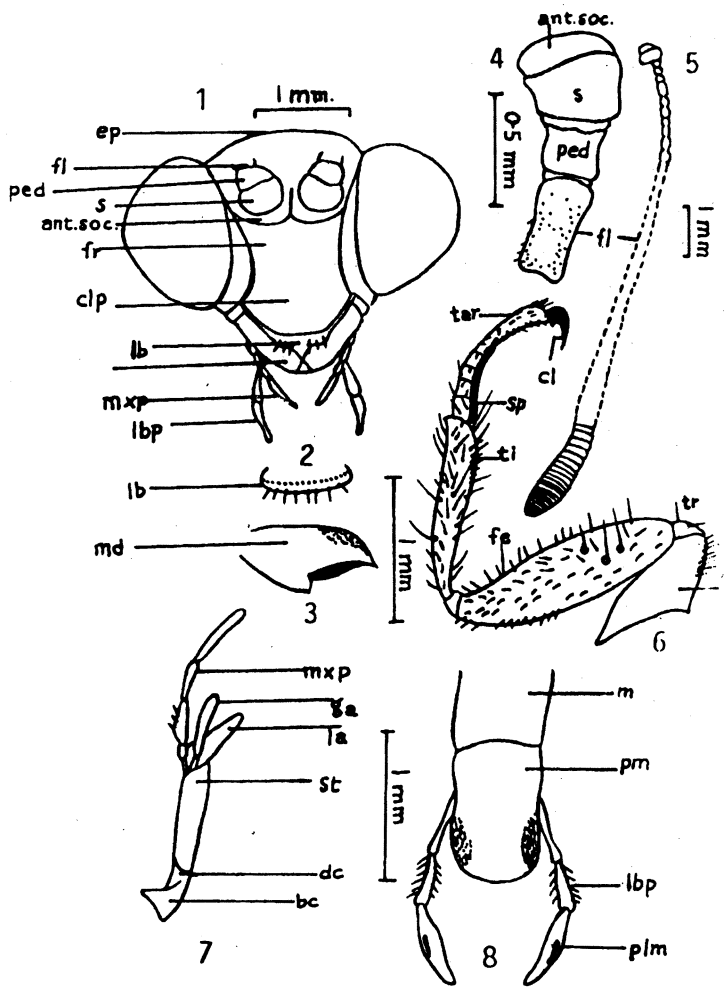
1	2	3	4	5	6	7	8	9	10
53. *Mallada alcestes* (Banks)				+Δ		+			
54. *Glenochrysa marmorata* (Needham)							+		
55. *Apertochrysa ? kichijoi* Kuwayama				+Δ			+		
56. *Brinckochrysa scelestes* (Banks)			+Δ		+Δ			+	
57. *Chrysopa pallens* (Rambur)								+	
58. *Chrysopa virgestes* Banks								+	
59. *Cunctochrysa albolineata* (Killington)	+Δ								+Δ
60. *Retipennia notata* (Navas)				+Δ				+	+
•61. *Retipennia hasegawai* (Nakahara)						+Δ			
*62. *Semachrysa polysticta* Brooks						+			
*63. *Semachrysa contorta* Brooks						+			
64. *Semachrysa matsumurae* (Okamoto)						+			
*65. *Joguina nicobarica* Brauer							+		
Family MYRMELEONTIDAE									
66. *Palpares pardus* Rambur								+	+
67. *Palpares contrarius* (Walker)				+Δ					
*68. *Layahima nebulosa* Navas								+	
•69. *Indoclystus singularis* (Westwood)									+Δ
•*70. *Dendroleon regius* (Navas)								+?	+?
71. *Gatzara jubilaea* Navas								+	+Δ
72. *Centroclisis horridus* (Walker)							+		
73. *Stiphroneura inclusa* (Walker)						+			+
74. *Myrmeleon clothilde* Banks								+	
75. *Myrmeleon montanus* Navas	+Δ							+	+Δ
76. *Myrmeleon assamensis* Ghosh [Female]				+			+		
77. *Myrmeleon berenice* Banks							+Δ		
78. *Hagenomyia sagax* (Walker)							+Δ	+	+Δ
79. *Hagenomyia marginicollis* (Gerstaecker)							+Δ		
80. *Hagenomyia eurystictus* (Gerstaecker) ψ						+Δ			
•81. *Hagenomyia nigrinus* (Esben-Petersen) ψ	+Δ								
*82. *Hagenomyia monticolla* (Navas)								+	
83. *Hagenomyia jamduarensis* Ghosh							+		
*84. *Talosus oberthurai* Navas								+	
85. *Creoleon griseus* (Klug)							+Δ		

1	2	3	4	5	6	7	8	9	10
*86. *Allogama irene* (Banks)								+	
⊗ 87. *Neuroleon* sp.				+Δ					
88. *Distoleon verendus* (Walker)	+Δ								
*89. *Distoleon bivittatum* Banks ψ	+								
90. *Distoleon sambalpurensis* Ghosh							+Δ	+	
91. *Distoleon audax* (Walker)				+	+	+		+	
*92. *Dolicholeon substigmalis* Navas								+	
*93. *Negrokus lebasi* Navas								+	
*94. *Baga montana* Navas								+	
Family ASCALAPHIDAE									
95. *Protidricerus elwesi* (MacLachlan)	+								
96. *Idricerus decrepitus* (Walker)						+			
97. *Agrionosoma dohrni* Weele								+	+
*98. *Agrionosoma swinhoei* Weele						+			
99. *Suhpalacsa orsedice* Banks	+							+	
100. *Suphalomitus verbosus* (Walker)						+			+
101. *Suphalomitus brevis* Kimmins						+		+	
102. *Acheron trux* (Walker)				+Δ		+	+	+	+
102a. *A. t. loquax* (Walker)				+Δ		+	+	+	
*102b. *A. t. trux* (Walker)						+	+	+	+
*103. *Ogcogaster tesselata* (Westwood)									
104. *Hybris angulata* (Westwood)				+Δ			+		
105. *Ascalaphus prothoracicus* (Kimmins)						+Δ	+		+
106. *Ascalaphus dicax* (Walker)							+	+	
107. *Ascalaphus sinister* (Walker)	+Δ							+	
Family CORYDALIDAE									
*108. *Neochauliodes obscurus* Weele			+						
*109. *Neochauliodes khasianus* Weele						+			
110. *Neochauliodes sinensis* (Walker)	+								
*111. *Neochauliodes indicus* (Weele)						+	+	+	+
112. *Neochauliodes simplex* (Walker)						+			
113. *Protohermes albipennis* (Walker)						+			
114. *Protohermes anticus* (Walker)						+		+	+Δ
115. *Protohermes arunachalensis* Ghosh	+								

1	2	3	4	5	6	7	8	9	10
*116. *Protohermes montanus* (MacLachlan)									+
*117. *Hermes costastriata* Weele						+			
118. *Hermes maculipennis* Gray						+			
*119. *Hermes selysi* Weele						+			
120. *Acanthacorydalis asiatica* Wood-Mason		+							
*121. *Acanthacorydalis orientalis* MacLachlan		+							
*122. *Acanthacorydalis horrenda* Navas		+							
123. *Corydalus territans* Navas									+
124. *Neoneuromus fenestralis* (MacLachlan)								+	+
*124a. *Neoneuromus fenestralis fenestralis* Weele								+	+
125. *Neoneuromus latratus* (MacLachlan)						+			+
125a. *Neoneuromus latratus latratus* Weele						+			+
*126. *Neoneuromus sikkimensis* (Weele)									+
127. *Neuromus decemmaculatus* (Walker)						+			
Family INOCELLIDAE									
•128. *Inocellia crassicornis* (Schummel)						+Δ			

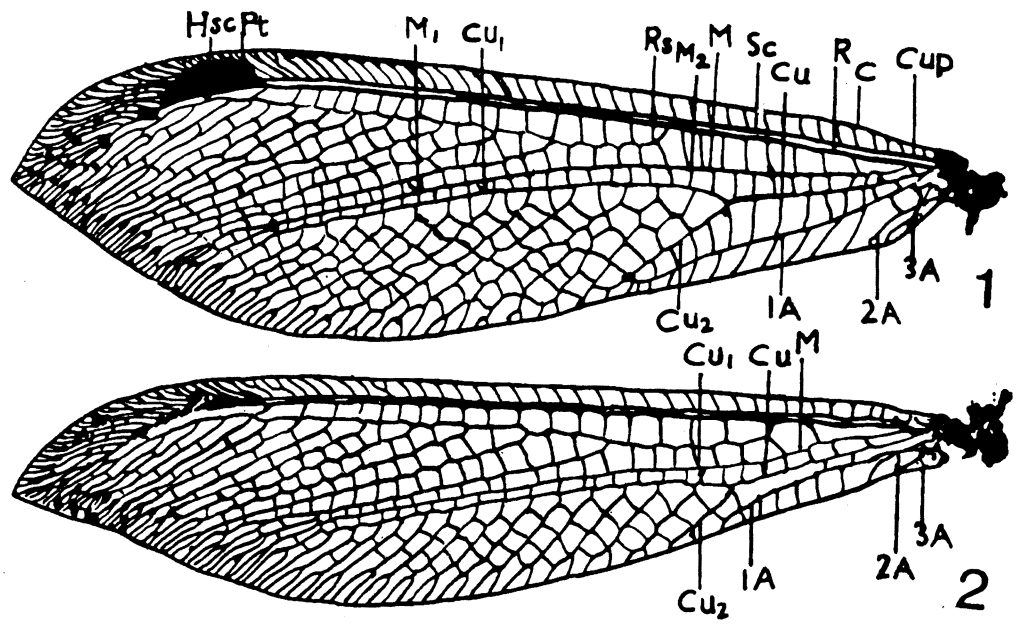
ψ Comb. nov.; Δ New locality record; (-) First record of genus from India; * Species reviewed from literature;
• First record of species from India; x Name of State not reported; ⊗ First record of genus and species from state.

PLATE 1
(Figs. 1-8)



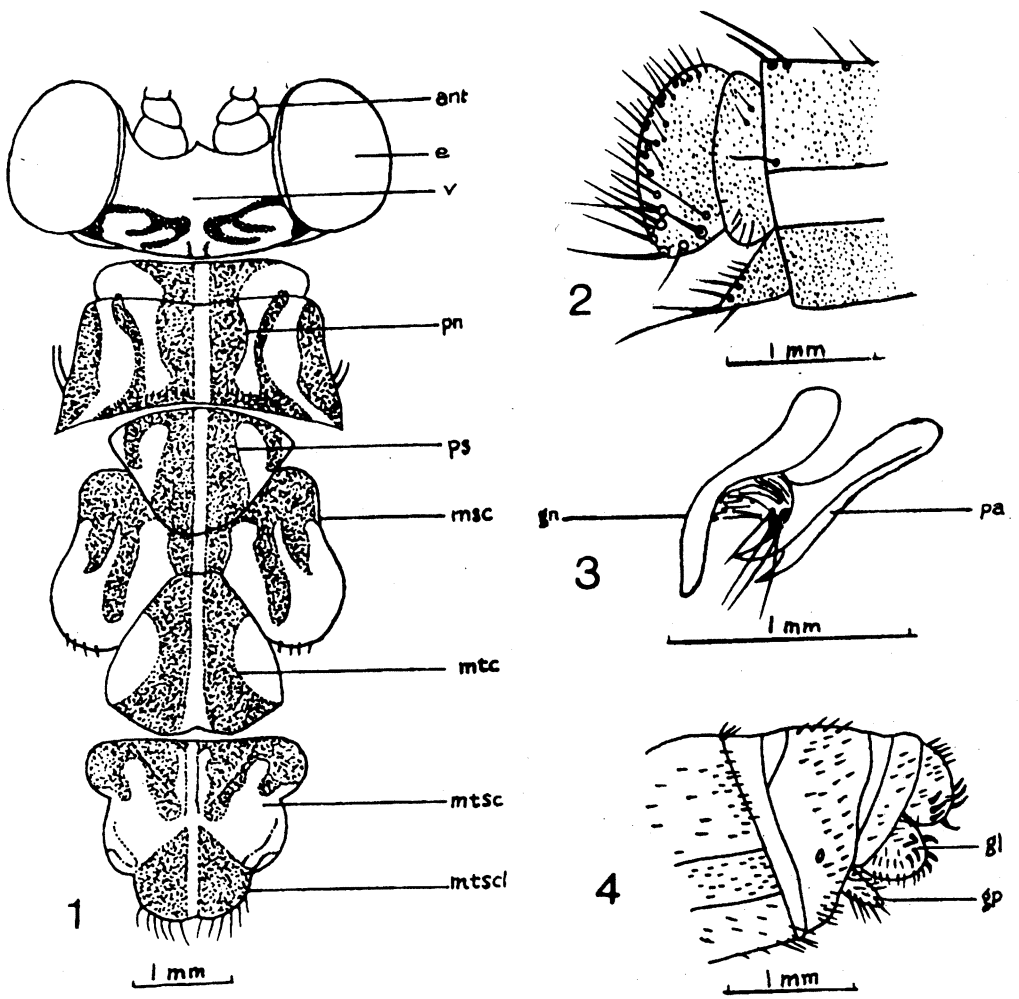
Figs. 1-8. *Distoleon verendus*, **1.** head; **2.** labrum; **3.** mandible; **4.** three basal segments of antenna (enlarged); **5.** antenna; **6.** hind leg; **7.** maxilla; **8.** labium (after Ghosh, 1984).

PLATE 2
(Figs. 1-2)



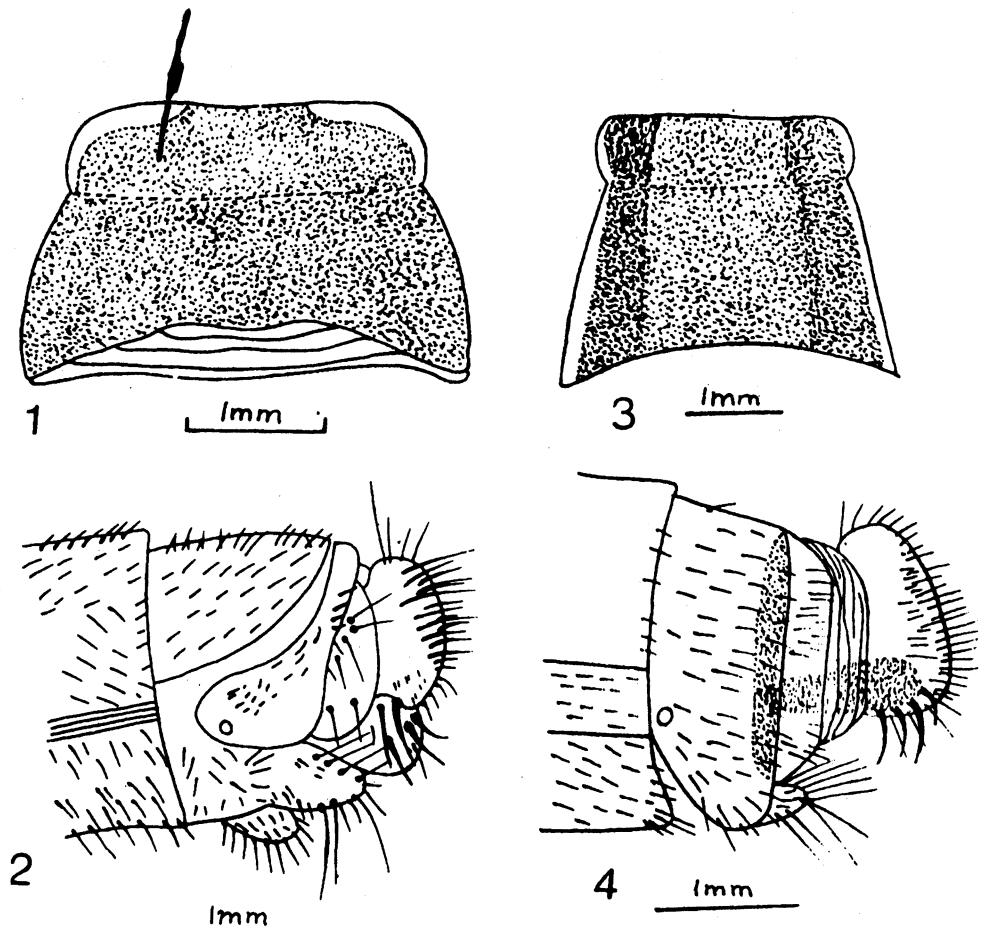
Figs. 1-2. *Distoleon verendus*, **1.** left forewing; **2.** left hindwing (after Ghosh, 1984).

PLATE 3
(Figs. 1-4)



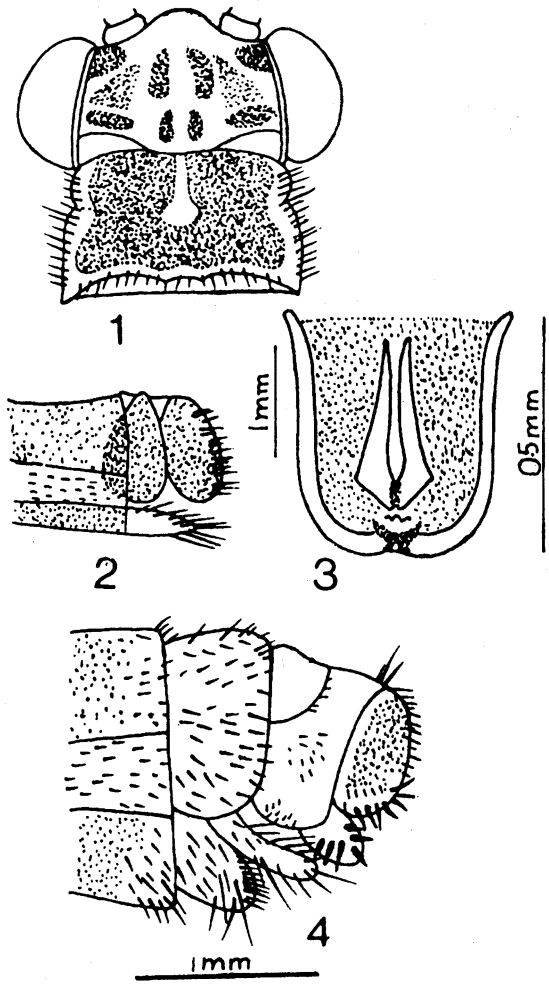
Figs. 1-4. *Distoleon verendus*, **1.** head and thorax; **2.** tip of male abdomen, lateral; **3.** male genitalia. lateral; **4.** tip of female abdomen, lateral (after Ghosh, 1984).

PLATE 4
(Figs. 1-4)



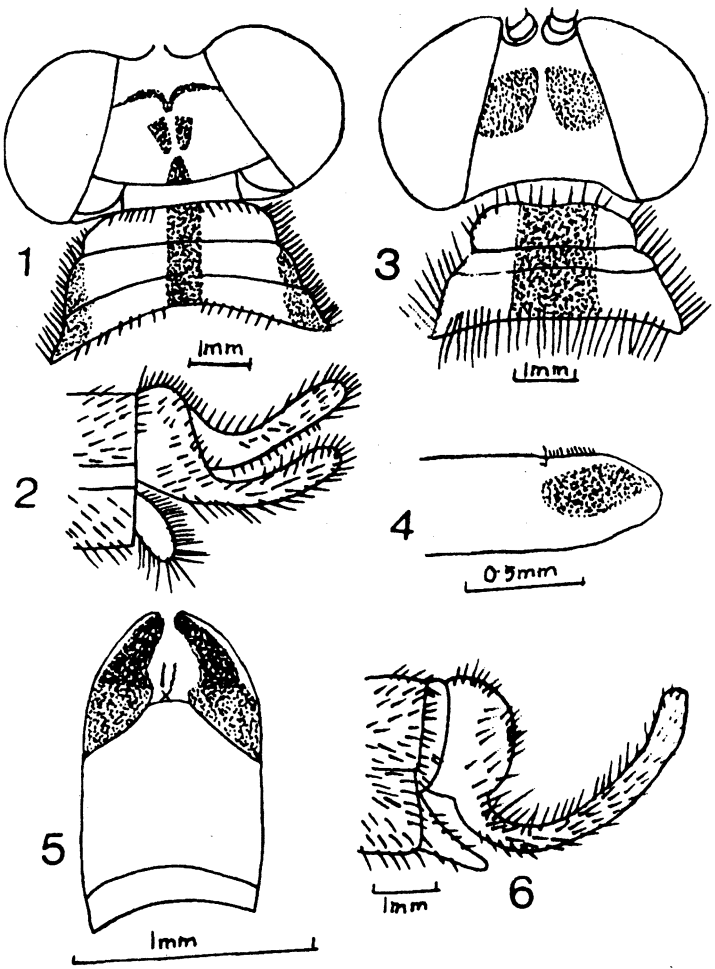
Figs. 1-2. *Hagenomyia eurystictus*, **1.** pronotum, dorsal; **2.** tip of male abdomen, lateral.
Figs. 3-4. *Centroclisis horridus*, **3.** pronotum, dorsal; **4.** tip of female abdomen, lateral (after Ghosh, 1984).

PLATE 5
(Figs. 1-4)



Figs. 1-4. *Hagenomyia jamduarensis*, **1.** head and pronotum, dorsal; **2.** tip of male abdomen, lateral; **3.** male genitalia; **4.** tip of female abdomen, lateral (after Ghosh, 1984).

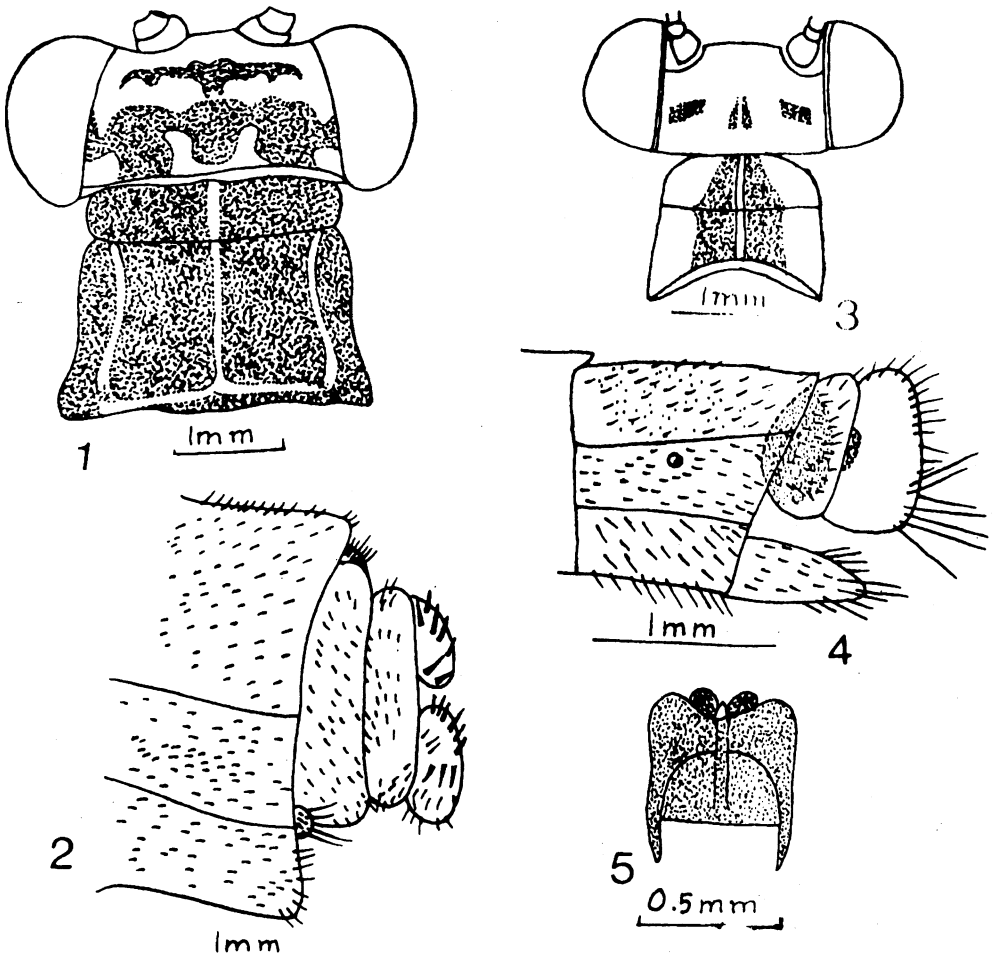
PLATE 6
(Figs. 1-6)



Figs. 1-2. *Palpares contrarius*, **1.** head and pronotum, dorsal; **2.** tip of male abdomen, lateral (after Ghosh, 1984).

Figs. 3-6. *Palpares pardus*, **3.** head and pronotum, dorsal; **4.** male genitalia, lateral; **5.** male genitalia, caudal; **6.** tip of male abdomen, lateral (after Ghosh, 1984).

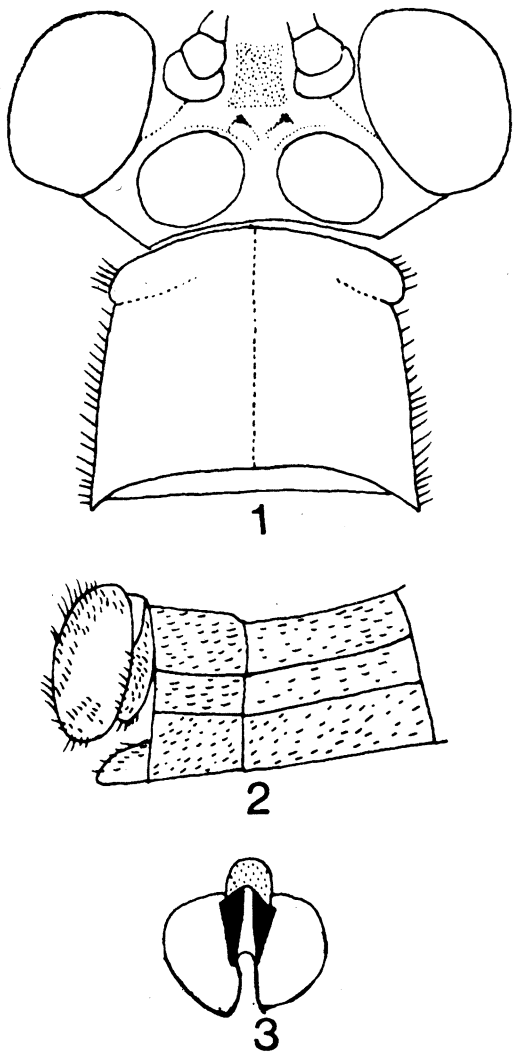
PLATE 7
(Figs. 1-5)



Figs. 1-2. *Distoleon sambalpurensis*, **1.** head and pronotum, dorsal; **2.** tip of female abdomen, lateral.

Figs. 3-5. *Myrmeleon assamensis*, **3.** head and pronotum, dorsal; **4.** male abdomen, lateral; **5.** male genitalia, dorsal (after Ghosh, 1984).

PLATE 8
(Figs. 1-3)



Figs. 1-3. *Indoclystus singularis*, **1.** head and pronotum, dorsal; **2.** tip of male abdomen, lateral; **3.** male genitalia, caudal.

PLATE 9
(Figs. 1-3)

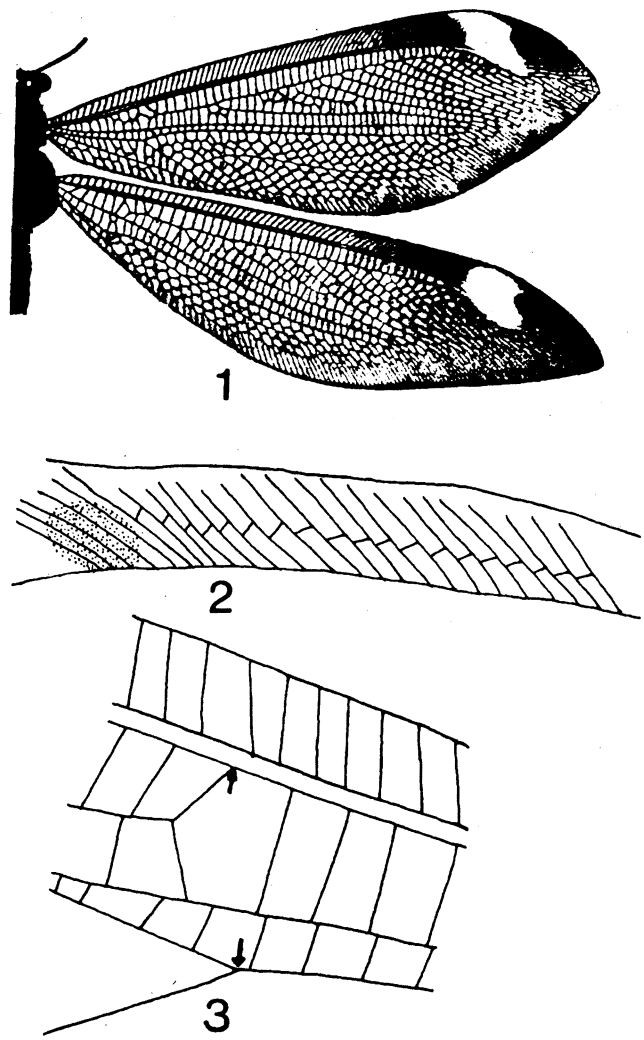
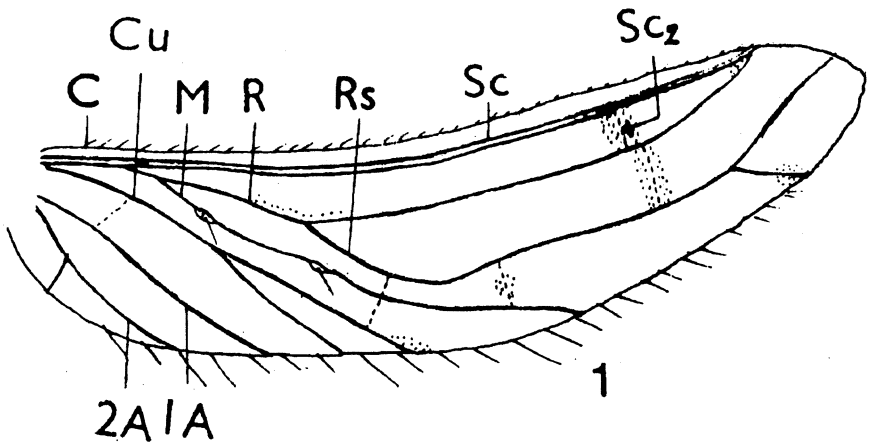


Fig. 1. *Hagenomyia eurystictus*, fore- and hindwing showing large milk-white pterostigma touching costa (after Ghosh, 1984).

Figs. 2-3. *Hagenomyia marginicollis*, **2.** part of costal region of forewing showing costal veinlets divided by transverse veinlets before pterostigma; **3.** arrows show origin of Rs at about the same level of cubital fork.

PLATE 10
(Figs. 1-2)



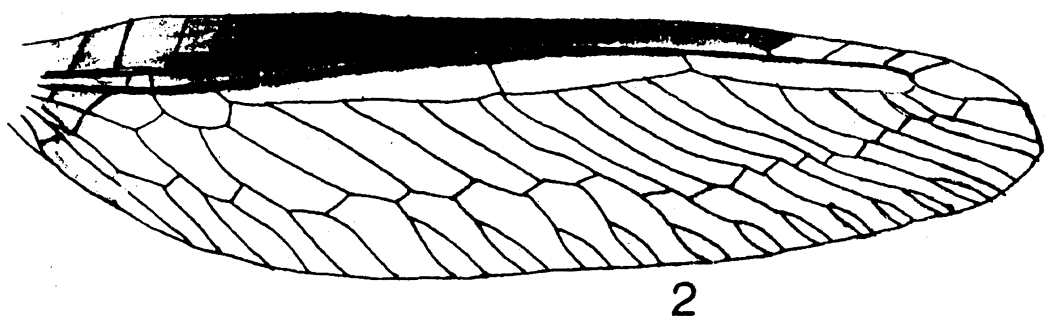
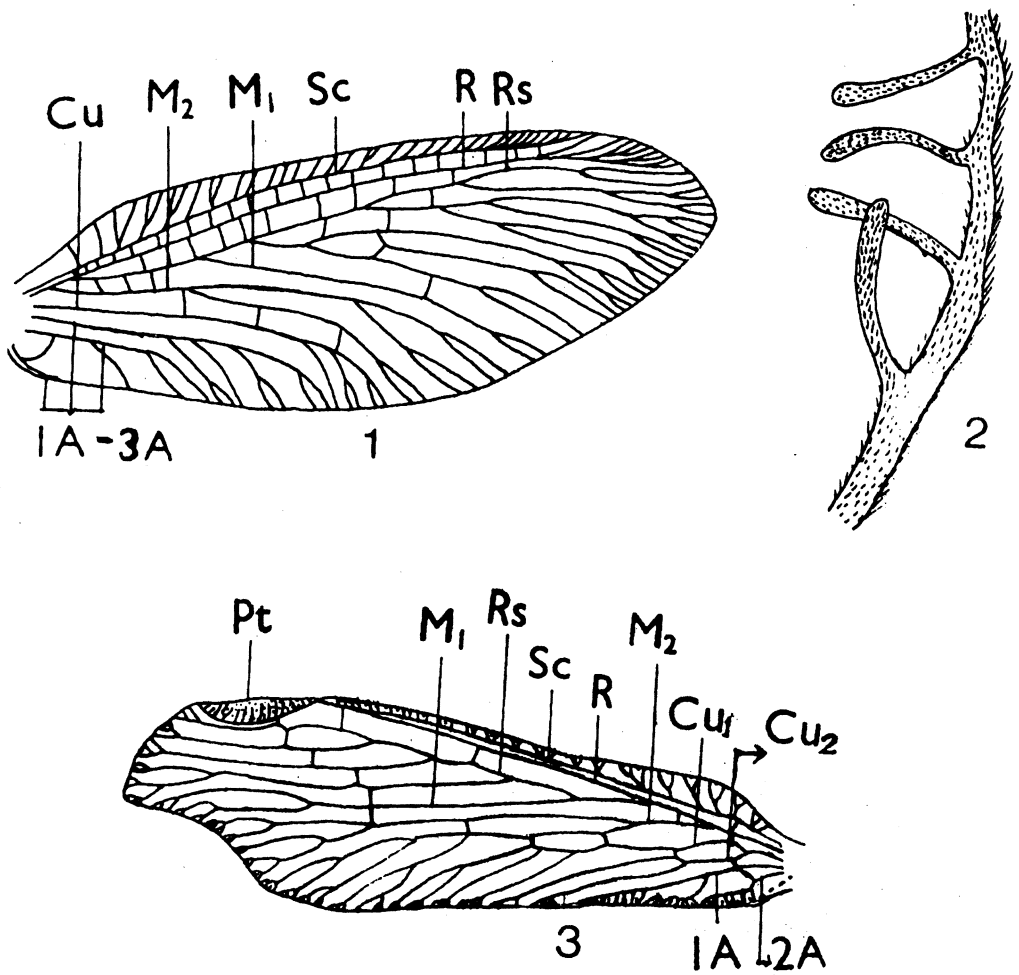


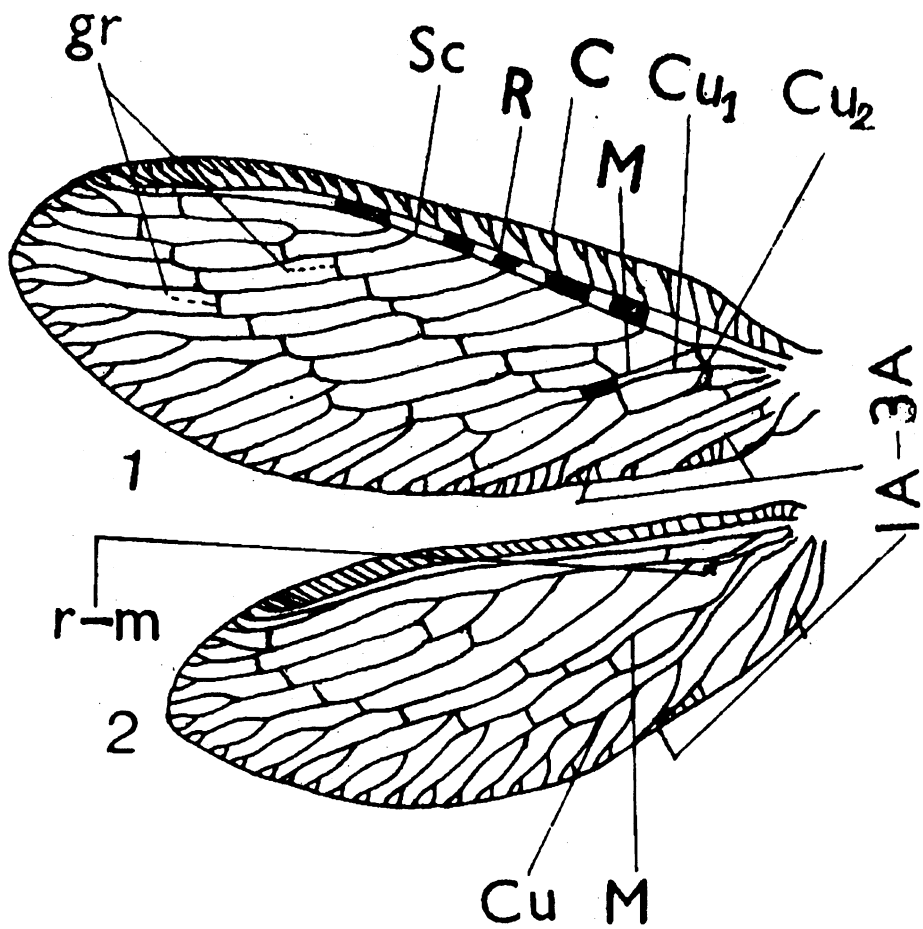
Fig. 1. *Coniocompsa indica*, right forewing. **Fig. 2.** *Mantispa nodosa*, right forewing.

PLATE 11
(Figs. 1-3)



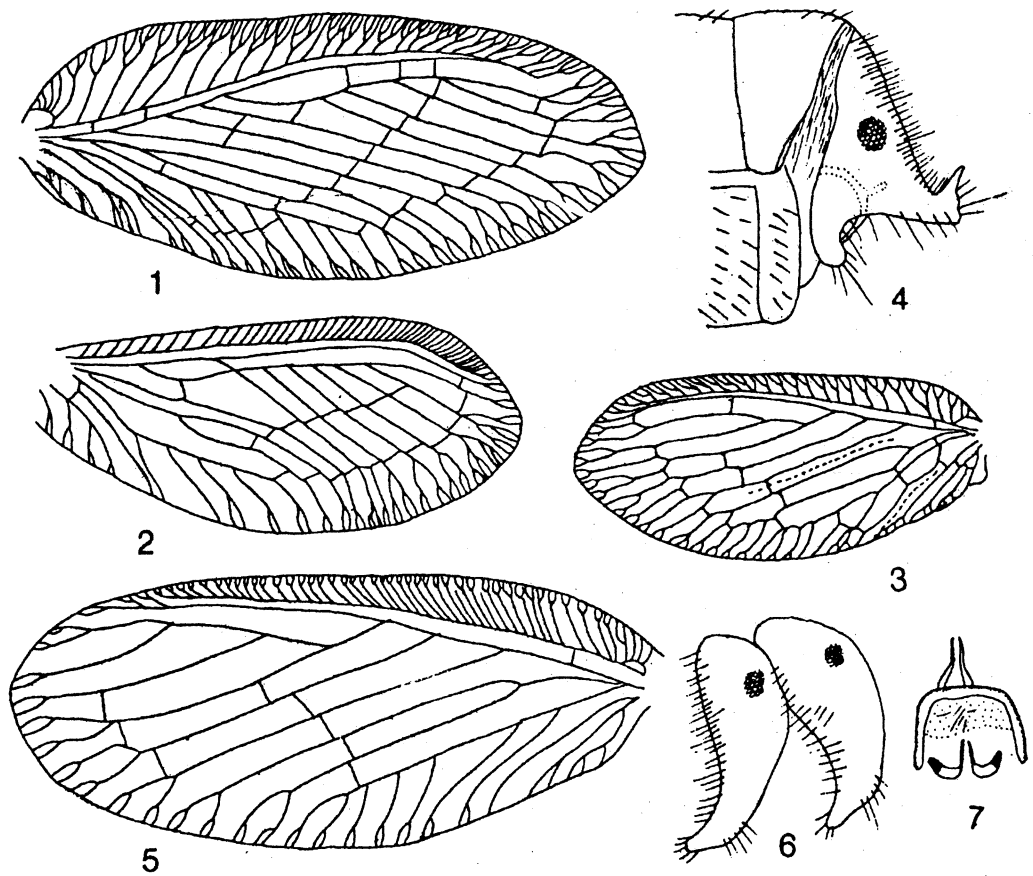
Figs. 1-2. *Dilar hornei*, **1.** right forewing; **2.** part of antenna.
Fig. 3. *Berotha insolita*, left forewing (after Aspock, 1983).

PLATE 12
(Figs. 1-2)



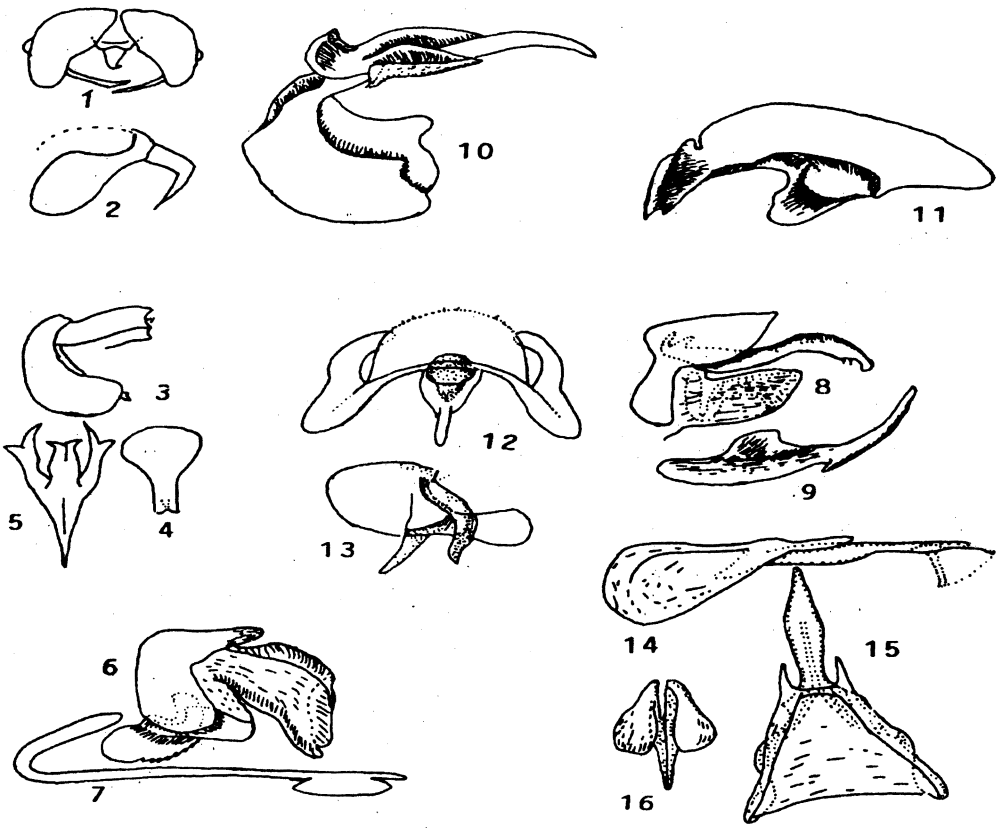
Figs. 1-2. *Micromus timidus* Hagen, **1.** forewing; **2.** hindwing.

PLATE 13
(Figs. 1-7)



Figs. 1-2. *Neuronema nepalensis*, **1.** right forewing; **2.** right hindwing.
Figs. 3-4. *Hemerobius humulinus*, **3.** left forewing; **4.** tip of male abdomen, lateral.
Figs. 5-7. *Hemerobius harmandinus*, **5.** left forewing; **6.** tip of male abdomen; **7.** male genitalia.

PLATE 14
(Figs. 1-16)



Figs. 1-2. *Micromus kapuri*, **1.** ectoproct with gonarcus, dorsal; **2.** gonarcus with arcessus, latero-dorsal.

Figs. 3-5. *Neuronema nepalensis*, **3.** gonarcus, lateral; **4.** aedeagus, dorsal; **5.** paramere, dorsal. (Figs. 1-5. after Nakahara, 1971).

Figs. 6-7. *Drepanacra khasiana*, **6.** 10th sternite, lateral; **7.** paramere, lateral. (after Kimmins 1940)

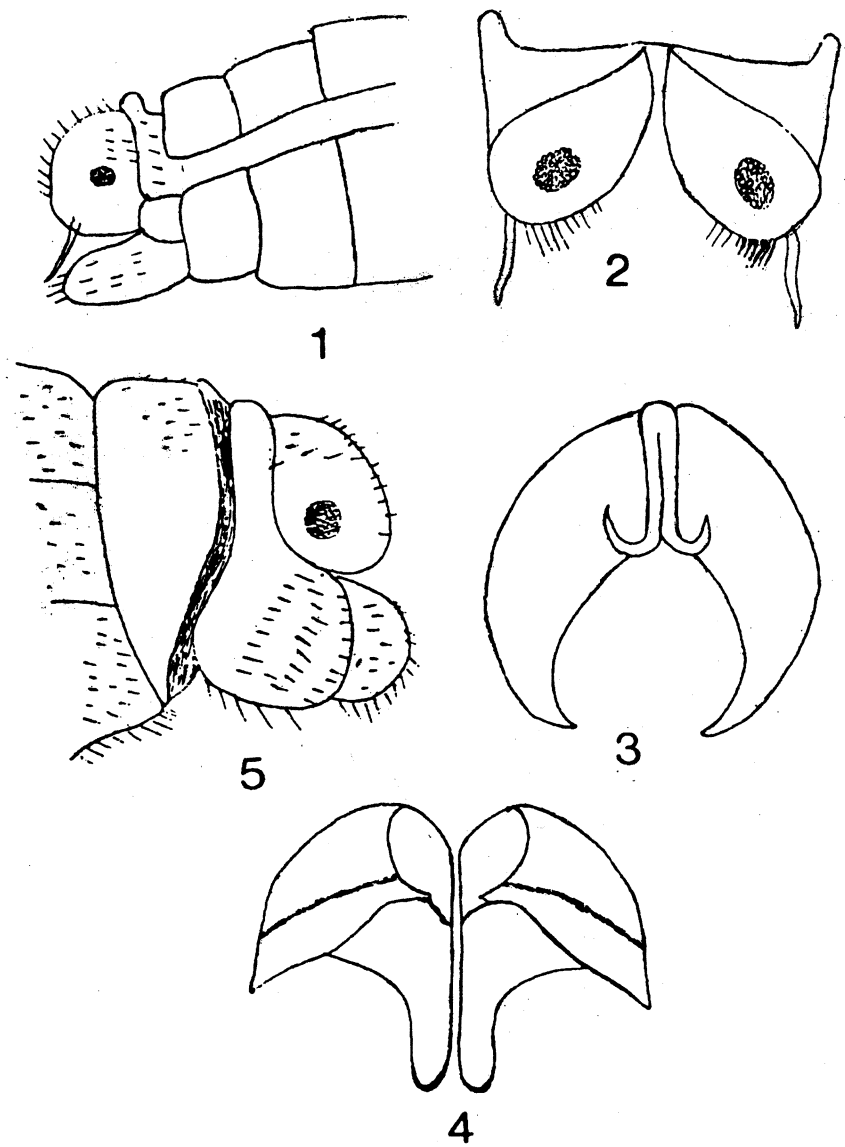
Figs. 8-9. *Neuronema decisum*, **8.** 10th sternite, lateral; **9.** paramere, lateral. (after Kimmins 1940)

Figs. 10-11. *Neuronema assamensis*, **10.** 10th sternite, oblique lateral; **11.** paramere, ventral. (Figs. 10-11. after Kimmins, 1943).

Figs. 12-13. *Micromus calidus*, **12.** gonarcus-mediuncus arcessus complex, antero-dorsal view; **13.** same, lateral view (after Monserrat, 1993).

Figs. 14-16. *Micromus timidus*, **14.** gonarcus with arcessus, lateral; **15.** same, dorsal; **16.** paramere, ventral (after Tjeder, 1961).

PLATE 15
(Figs. 1-5)



Figs. 1-5. *Neomicromus agarwalai*, **1.** tip of male abdomen, lateral; **2.** tip of male abdomen with catoprocessus, dorsal; **3.** gonarcus, dorsal; **4.** paramere, dorsal; **5.** tip of female abdomen, lateral (after Ghosh, 1990).

PLATE 16
(Fig. 1)

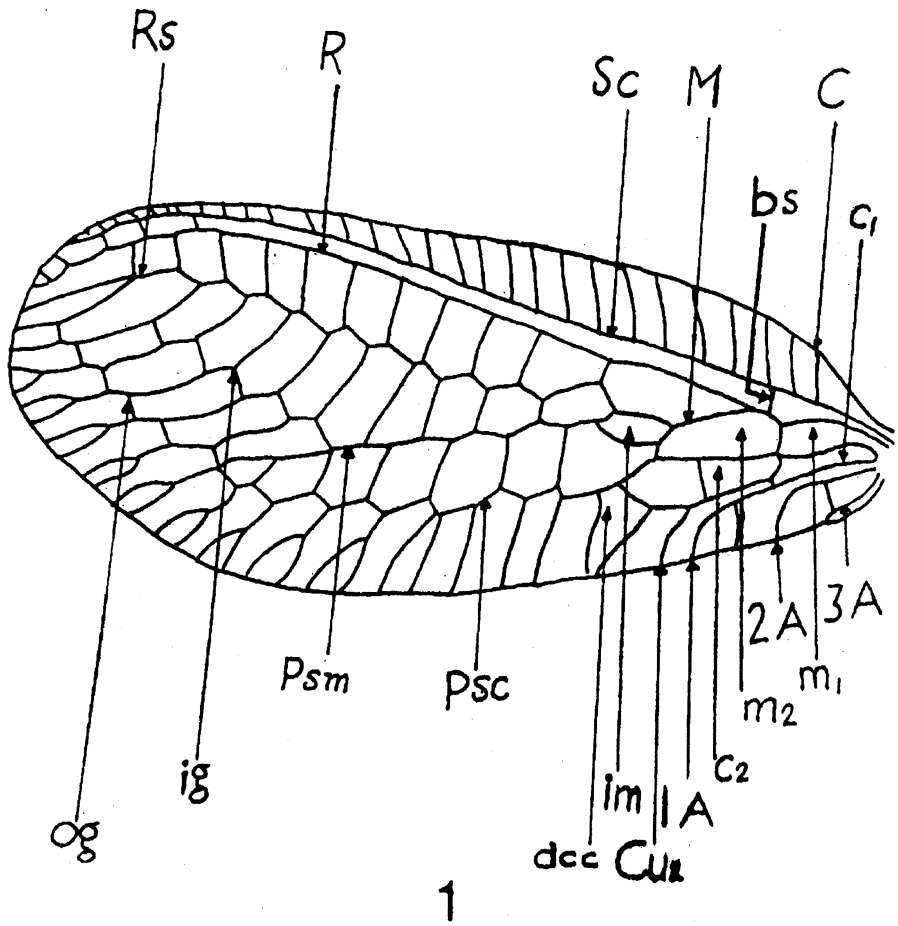
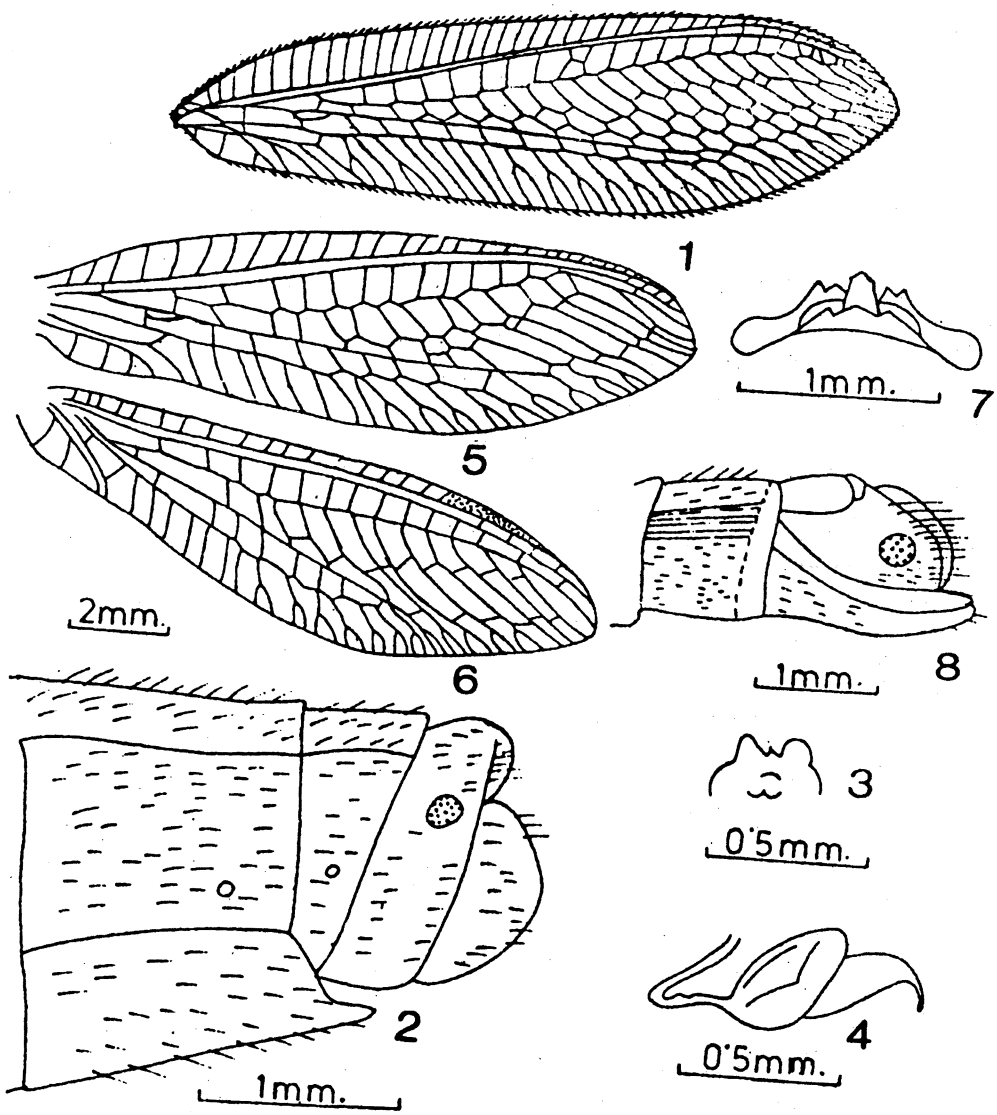


Fig. 1. *Chrysopa pallens* left forewing.

PLATE 17
(Figs. 1-8)



Figs. 1-4. *Tumeochrysa indica*, **1.** right forewing; **2.** tip of female abdomen lateral; **3.** subgenital plate, ventral; **4.** spermatheca, lateral.

Figs. 5-8. *Chrysopidia manipurensis*, **5.** right forewing; **6.** right hindwing; **7.** male genitalia, dorsal; **8.** tip of male abdomen, lateral (Fig. 1. after Needham, 1909 and figs. 2-8. after Ghosh, 1990).

PLATE 18
(Figs. 1-8)

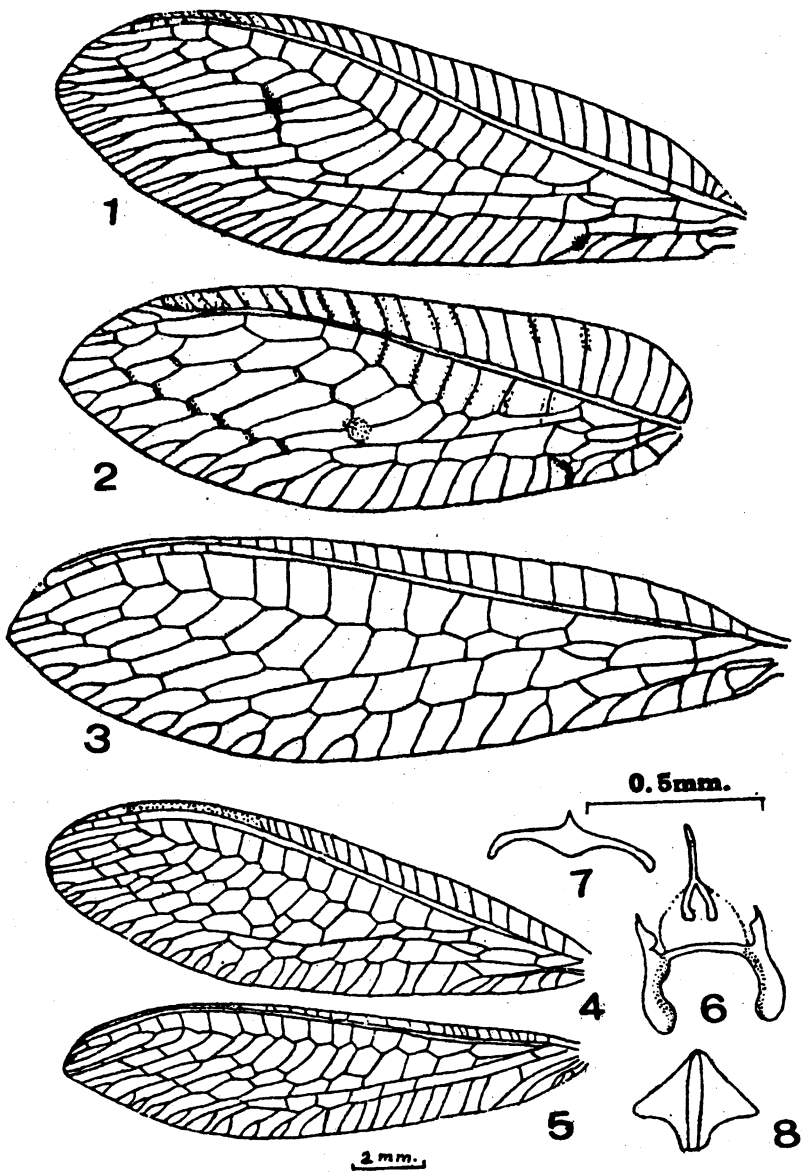


Fig. 1. *Retipennia hasegawai*, left forewing.
Fig. 2. *Ankylopteryx octopunctata*, left forewing.
Fig. 3. *Cunctochrysa albolineata*, left forewing.
Figs. 4-8. *Chrysopidia garhwalensis*, **4.** left forewing; **5.** left hindwing; **6.** gonarcus with arcessus (dorsal); **7.** tignum; **8.** gonapsis.

PLATE 19
(Figs. 1-6)

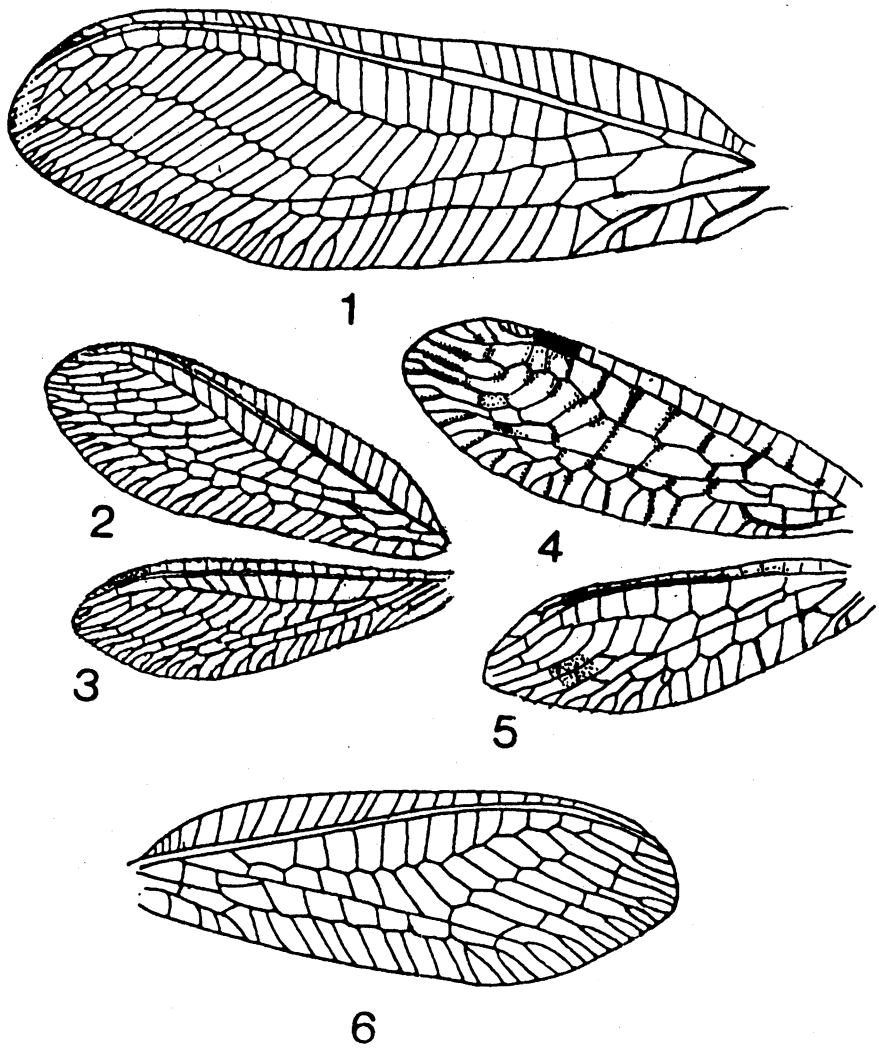
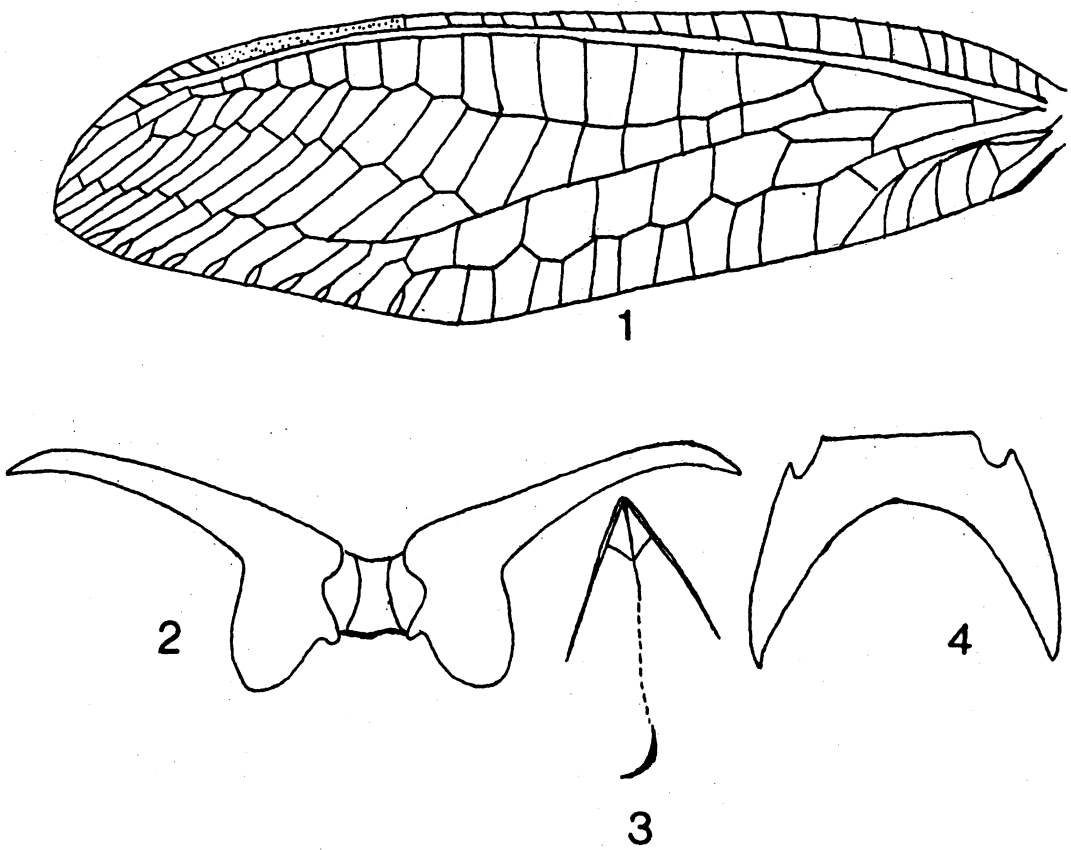


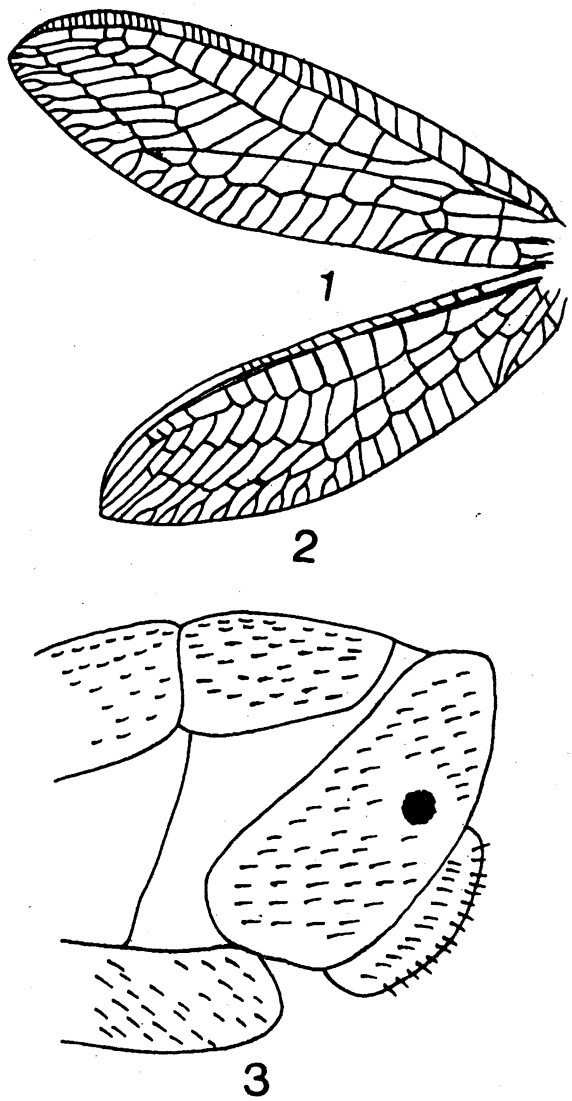
Fig. 1. *Italochrysa robusta* left forewing.
Figs. 2-3. *Chrysopidia nigrata*; **2.** left forewing; **3.** left hindwing.
Figs. 4-5. *Glenochrysa marmorata*, **4.** left forewing; **5.** left hindwing.
Fig. 6. *Italochrysa sp.* **2.** right forewing (Figs. 1 & 2 after Ghosh, 1990).

PLATE 20
(Figs. 1-4)



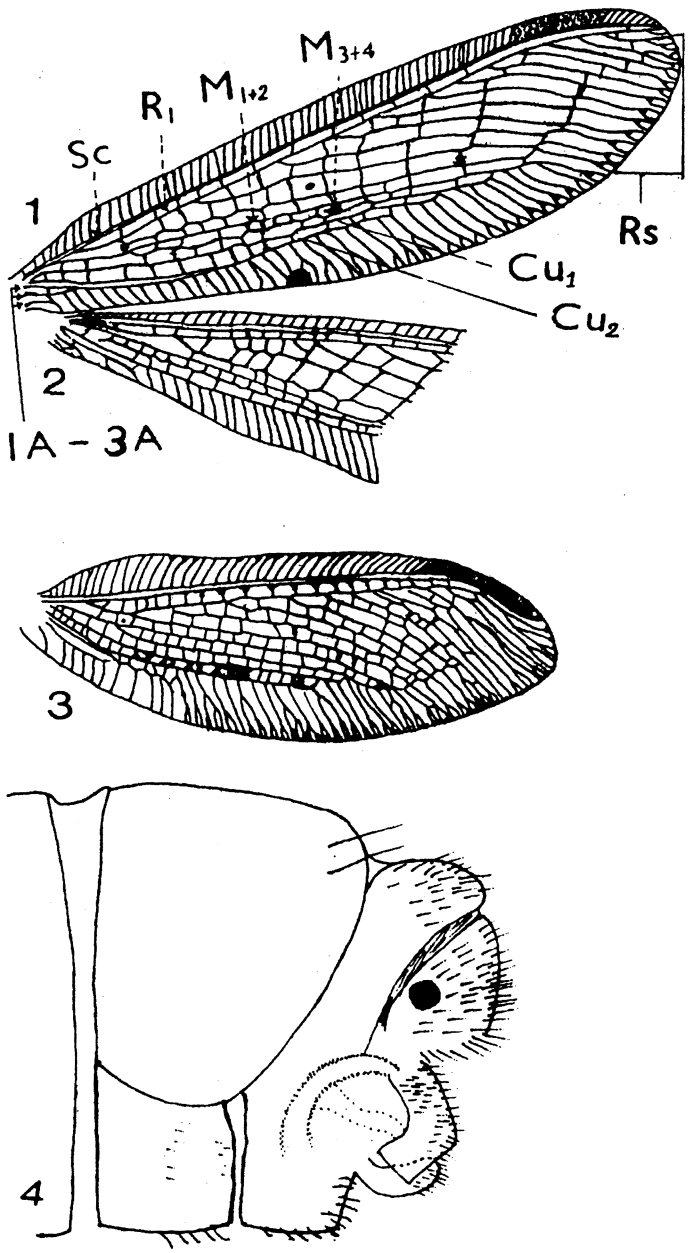
Figs. 1-4. *Italochrysa sp.* 1, **1.** left forewing; **2.** paramere, dorsal; **3.** hypandrium internum and comes, dorsal; **4.** gonarcus, caudal.

PLATE 21
(Figs. 1-3)



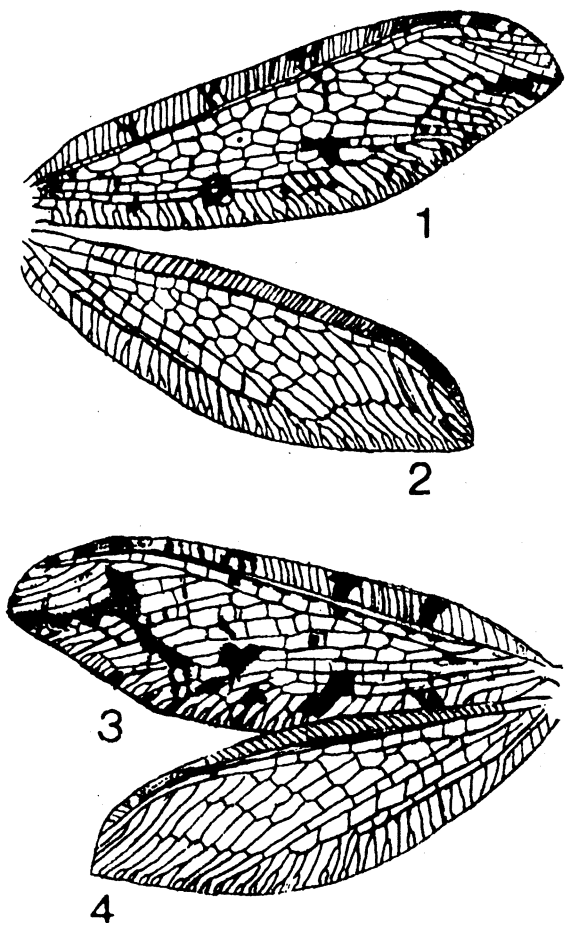
Figs. 1-3. *Italochrysa flavobrunnea*, **1.** left forewing; **2.** left hindwing; **3.** tip of female abdomen, lateral (after Ghosh, 1981).

PLATE 22
(Figs. 1-4)



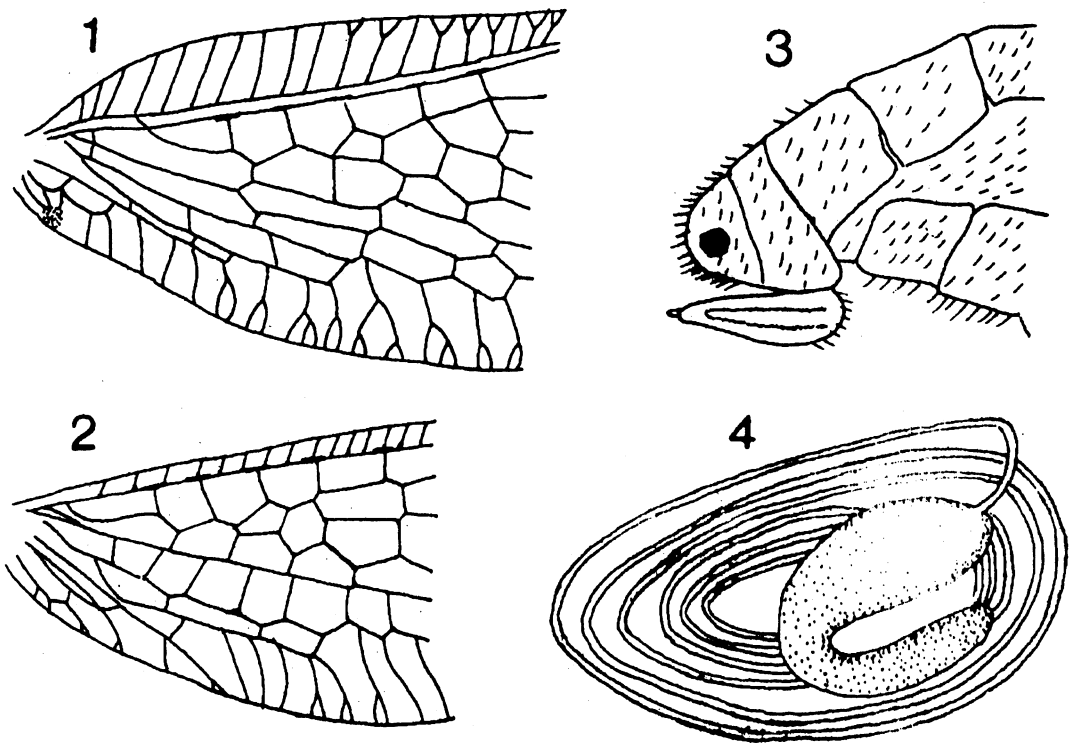
Figs. 1-2. *Spilosmylus tuberculatus*, **1.** right forewing; **2.** part of right hindwing.
Figs. 3-4. *Parosmylus belaae*, **3.** right forewing; **4.** tip of female abdomen, lateral.

PLATE 23
(Figs. 1-4)



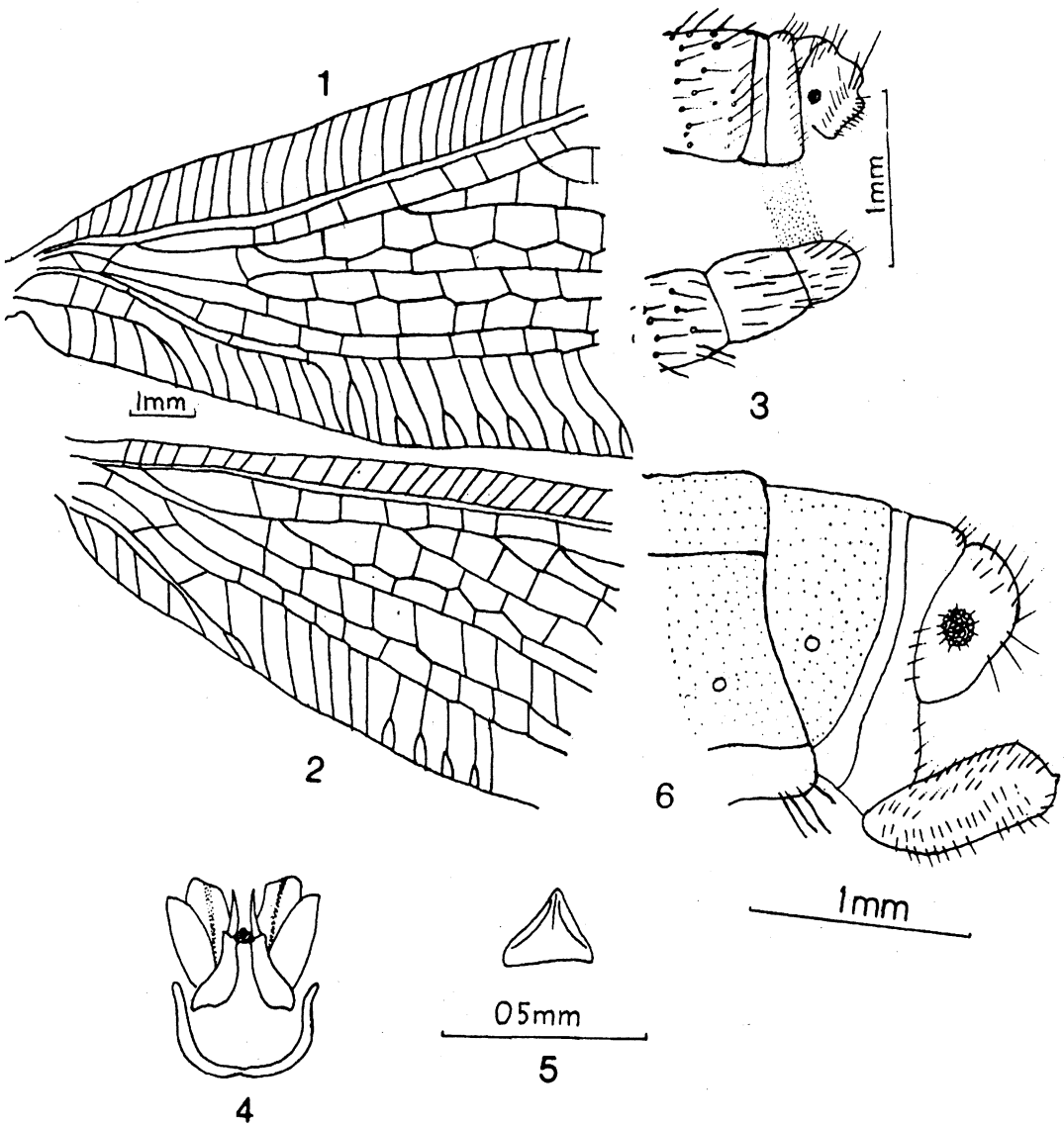
Figs. 1-2. *Thyridosmylus perspicillaris fenestratus*, **1.** right forewing; **2.** right hindwing.
Figs. 3-4. *Thyridosmylus langi*, **3.** left forewing; **4.** left hindwing (Figs. 1-4. redrawn from photography of the wings after Kimmins, 1942).

PLATE 24
(Figs. 1-4)



Figs. 1-4. *Thyridosmylus perspicillaris fenestratus*, **1.** part of right forewing; **2.** part of right hindwing; **3.** tip of female abdomen lateral; **4.** female genitalia, lateral.

PLATE 25
(Figs. 1-6)



Figs. 1-6. *Spilosmylus darjeelingensis*, **1.** part of right forewing; **2.** part of right hindwing; **3.** tip of male abdomen; **4.** subarcus and parameres, caudal; **5.** hypandrium internum, dorsal; **6.** tip of female abdomen, lateral.

PLATE 26
(Figs. 1-4)

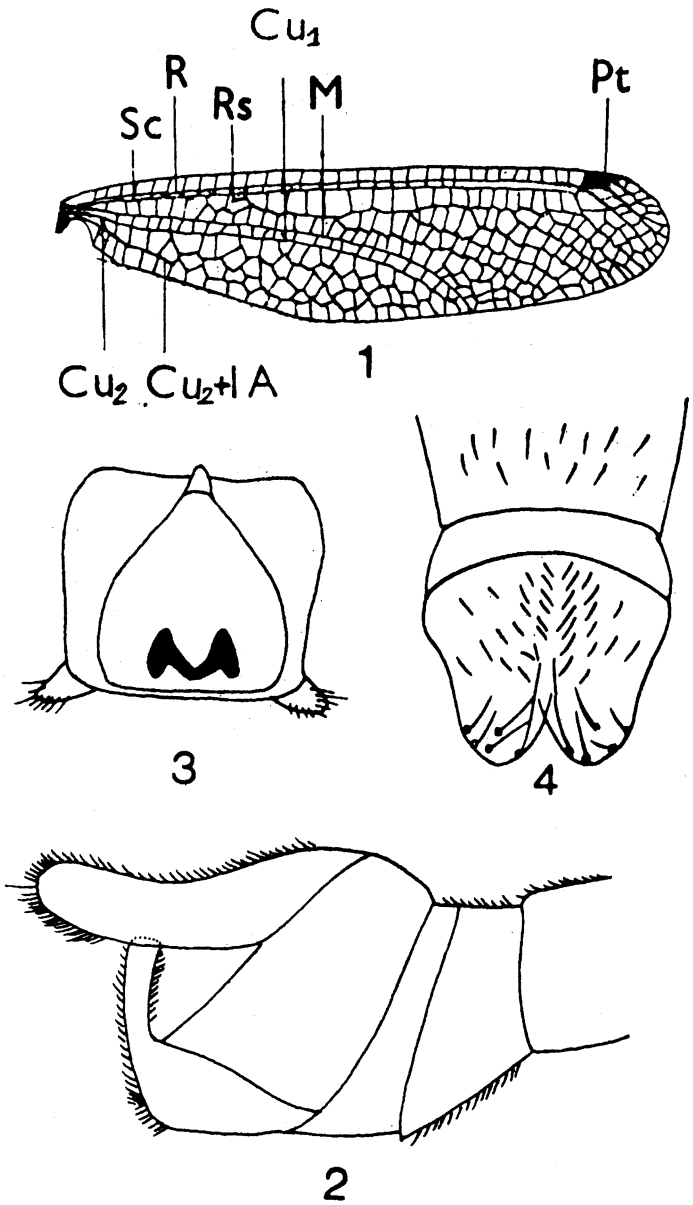


Fig. 1. *Agrionosoma dohrni*, right forewing.
Figs. 2-3. *Hybris angulata*, **2.** tip of male abdomen, lateral; **3.** male terminalia, dorsal.
Fig. 4. *Acheron trux*, tip of male abdomen, dorsal.

PLATE 27
(Figs. 1-9)

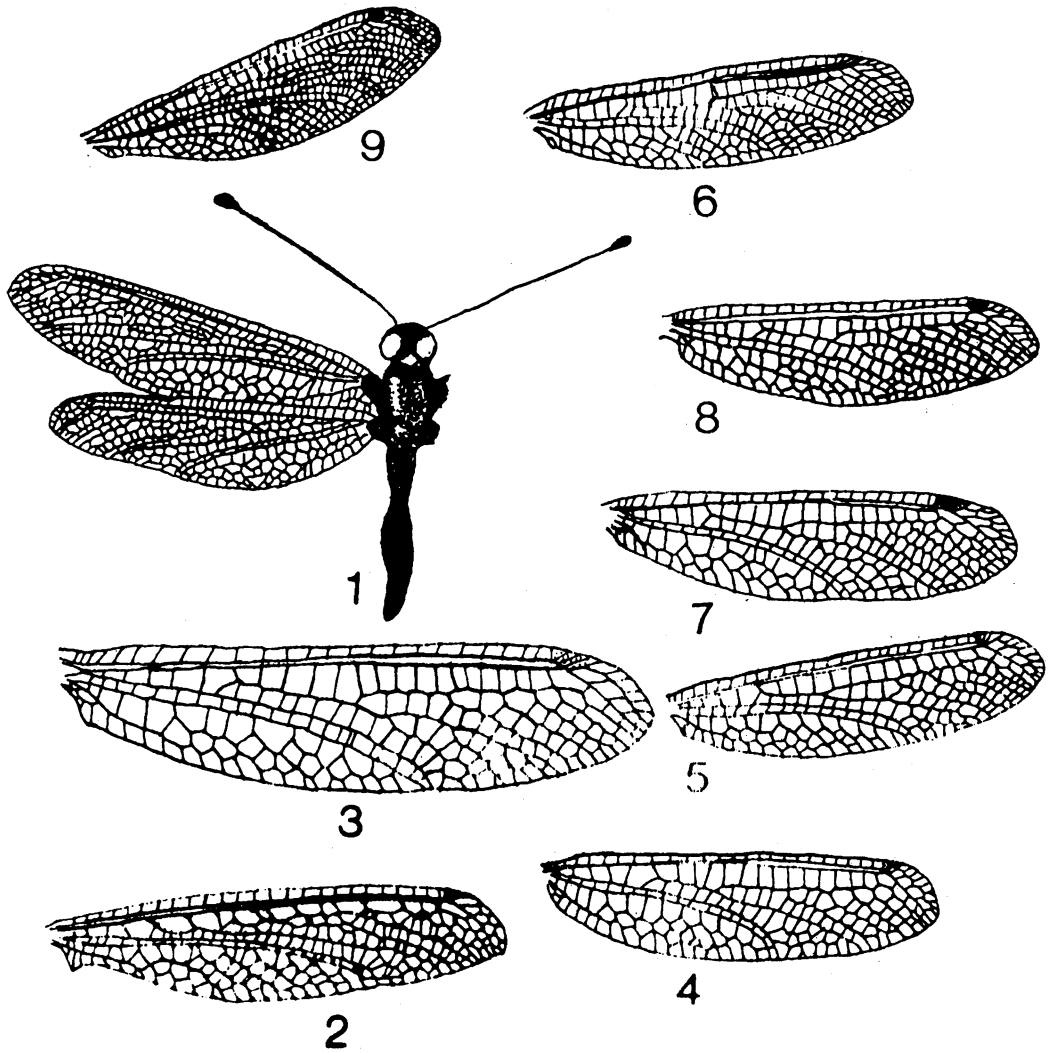
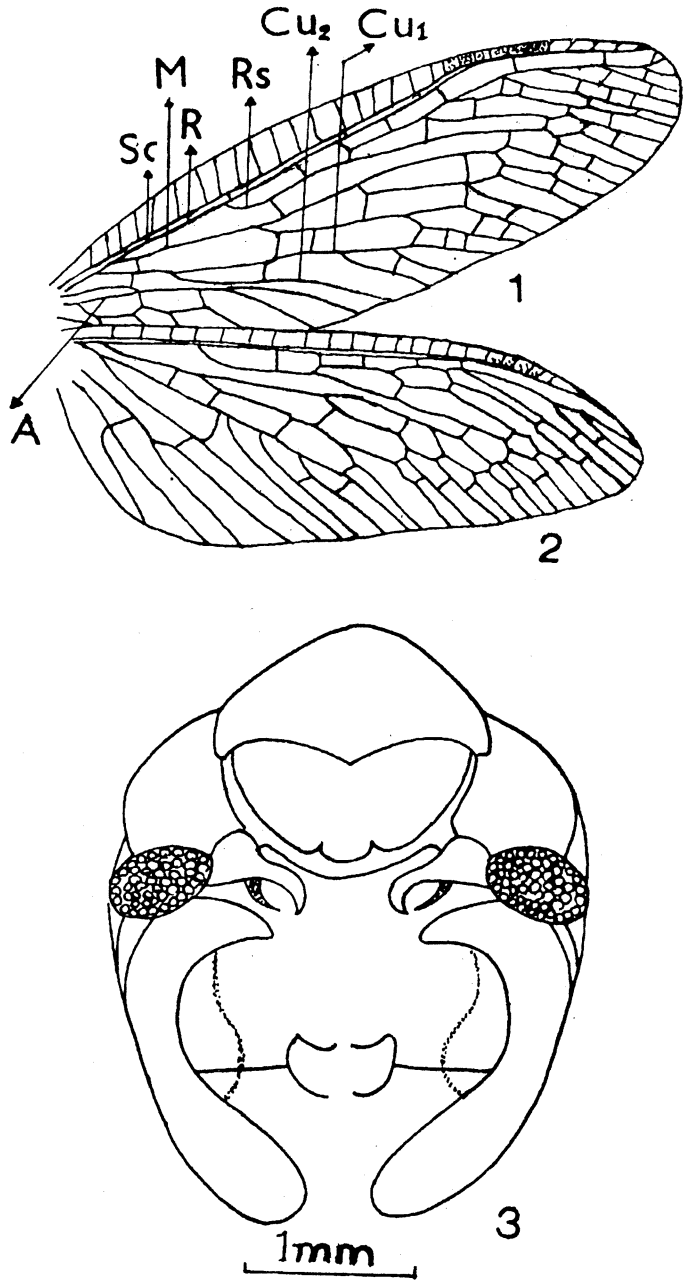


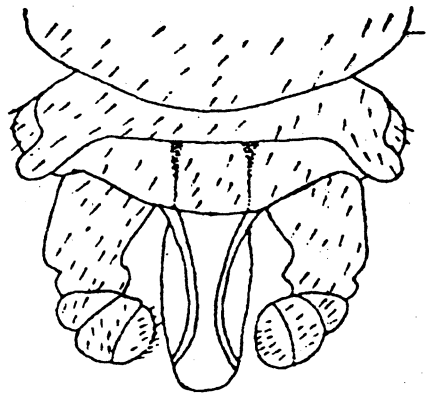
Fig. 1-9. *Protidricerus elwesi*, **1.** body with antennae, left fore- and hindwings. **2.** *Idricerus decrepitus*, right forewing. **3.** *Suphalomitus verbosus*, right forewing. **4.** *Suphalomitus brevis*, right forewing. **5.** *Suhpalacsa orsedice*, right forewing. **6.** *Ascalaphus prothoracicus*, right forewing. **7.** *Ascalaphus dicax*, right forewing. **8.** *Ascalaphus sinister*, right forewing. **9.** *Hybris angulata*, right forewing (fig. 1. after Weele, 1908).

PLATE 28
(Figs. 1-3)

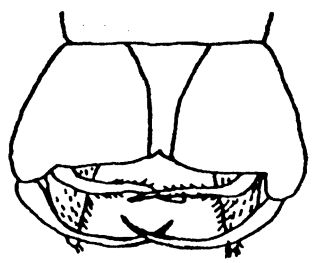


Figs. 1-3. *Protohermes albipennis*, **1.** right forewing; **2.** right hindwing; **3.** male genitalia, ventral.

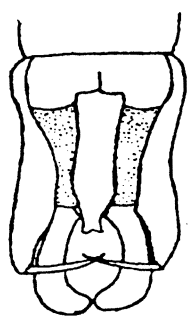
PLATE 29
(Figs. 1-3)



1



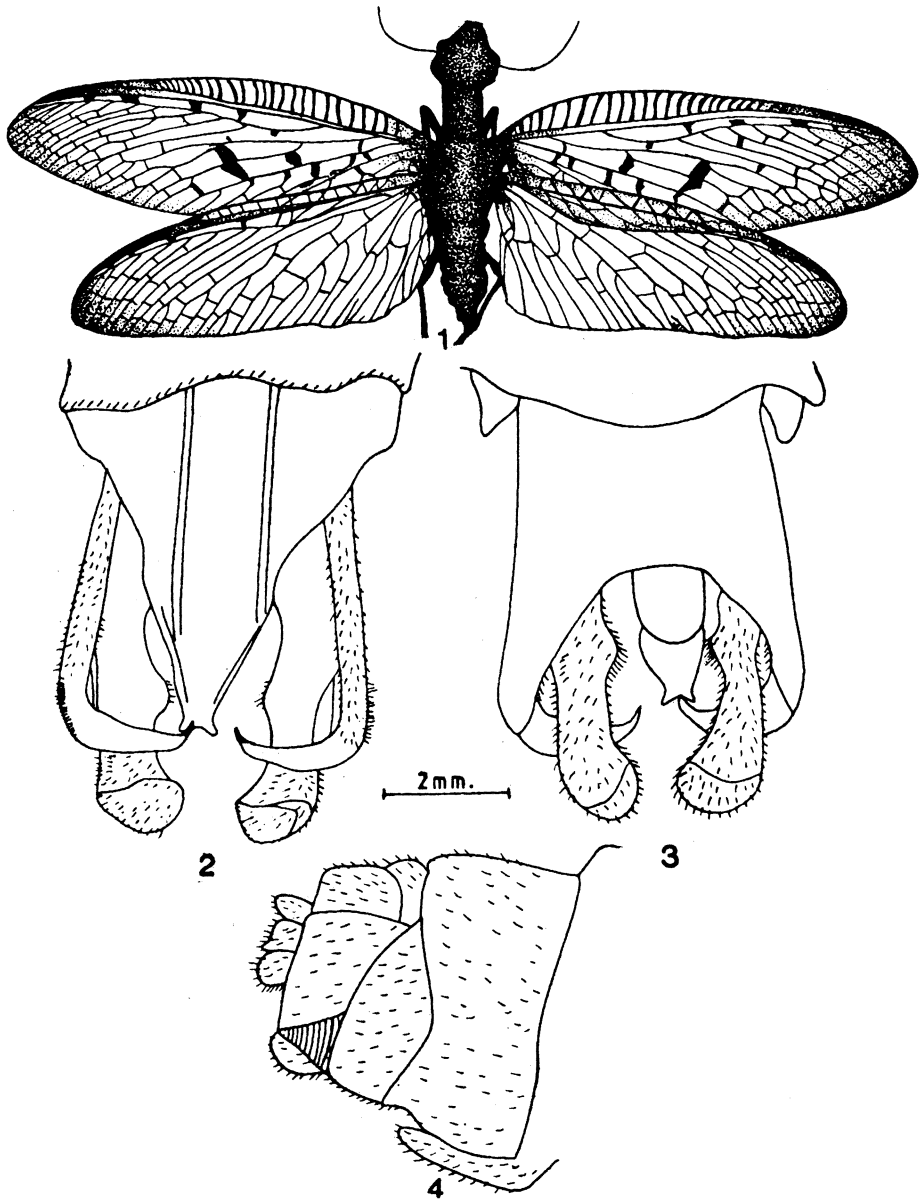
2



3

Fig. 1-3. *Neochauliodes simplex*, **1.** tip of male abdomen. **2.** *Protohermes anticus*, tip of male abdomen, dorsal. **3.** *Neoneuromus sikkimensis*, tip of male abdomen, ventral (figs. 2 & 3 after Weele, 1907).

PLATE 30
(Figs. 1-4)



Figs. 1-4. *Neoneuromus latratus latratus* **1.** Body; **2.** tip of abdomen in male showing genital armature, ventral; **3.** same, dorsal; **4.** tip of abdomen in female. (Fig. 1. redrawn from photography of Weele, 1910).

PLATE 31
(Figs. 1-3)

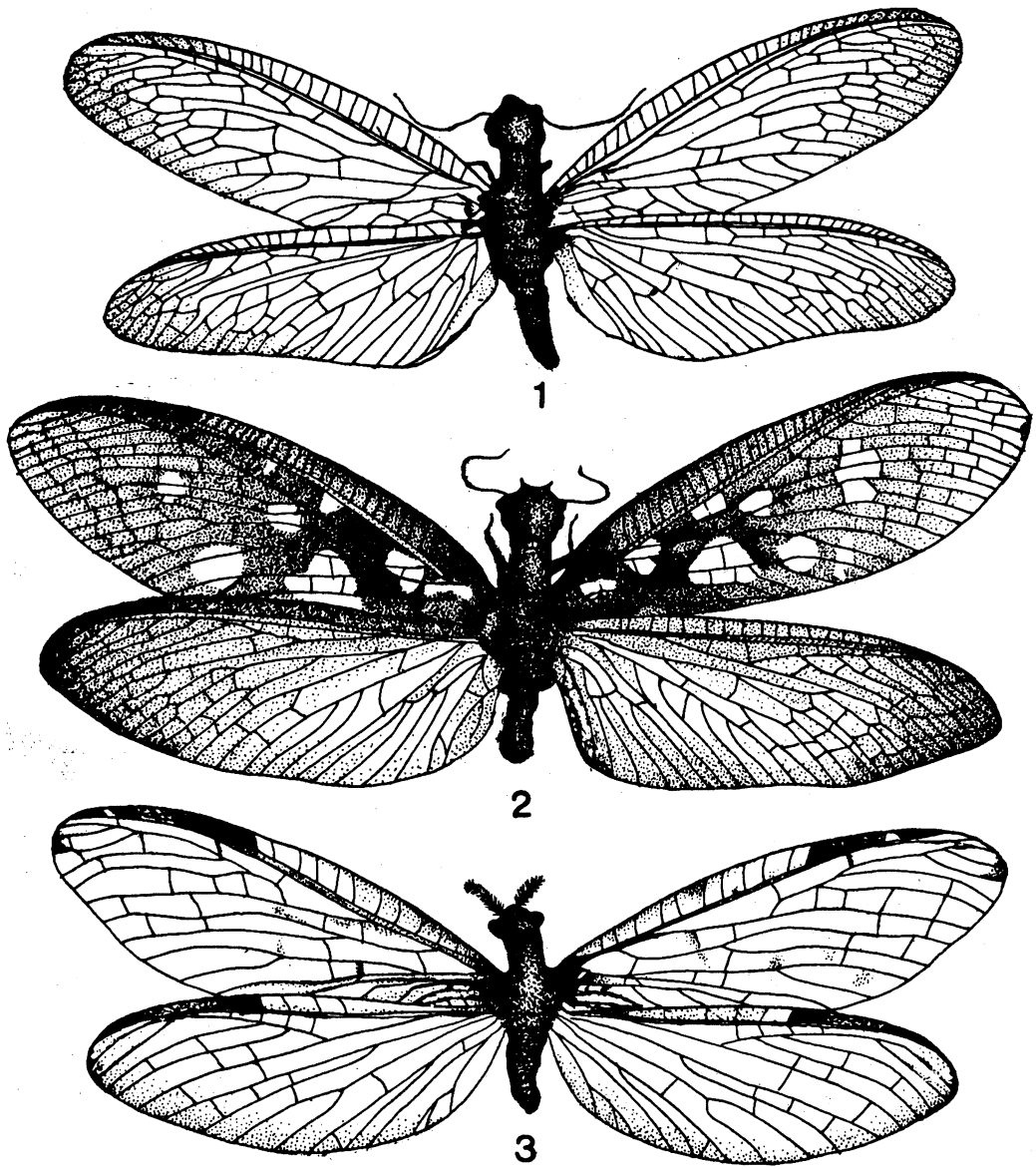


Fig. 1-3.· *Protohermes albipennis*, **1.** body **2.** *Protohermes anticus*, body **3.** *Neochauliodes simplex*, body (figs. 1-3. Redrawn after photography of Weele, 1910).

PLATE 32
(Figs. 1-5)

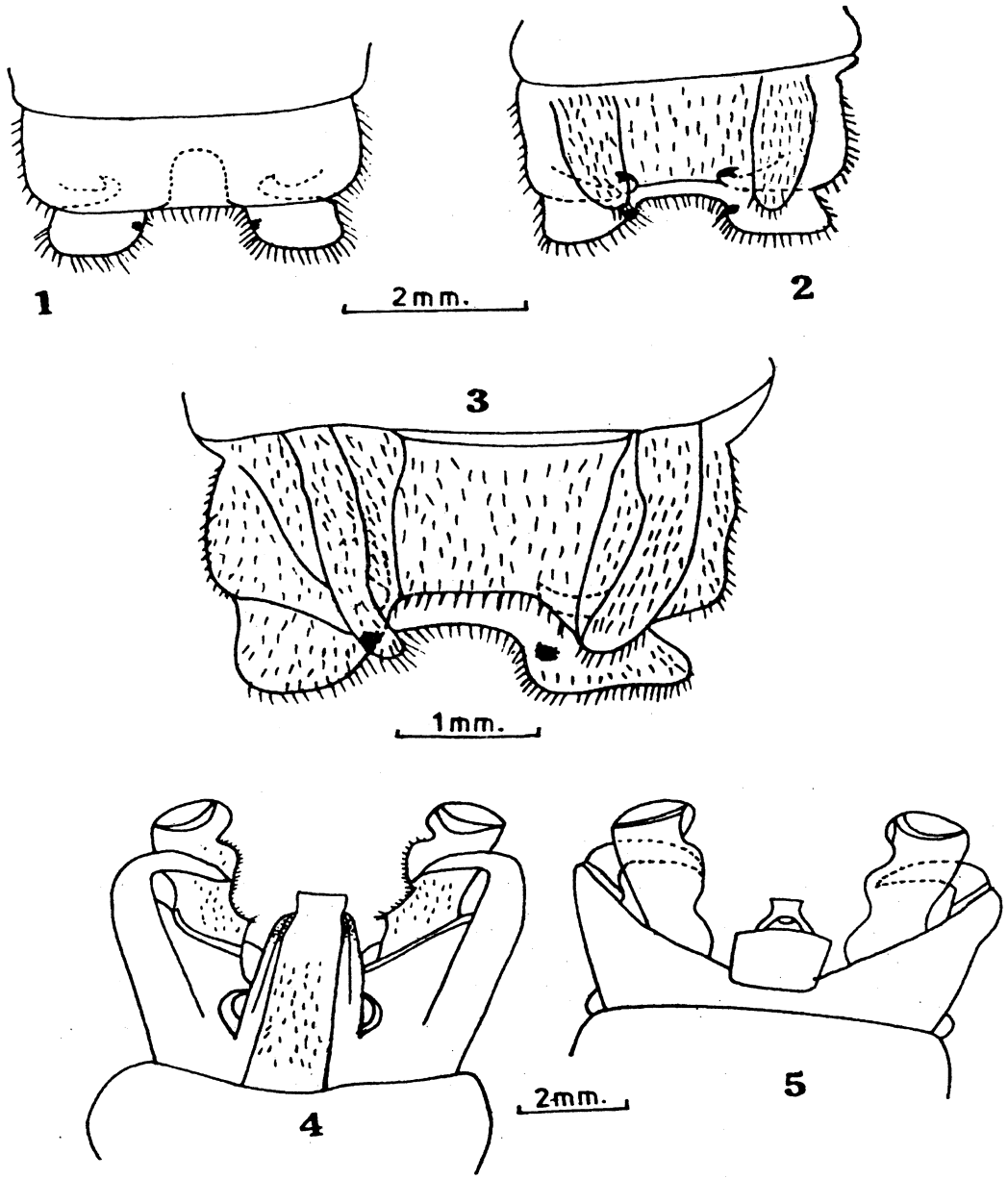
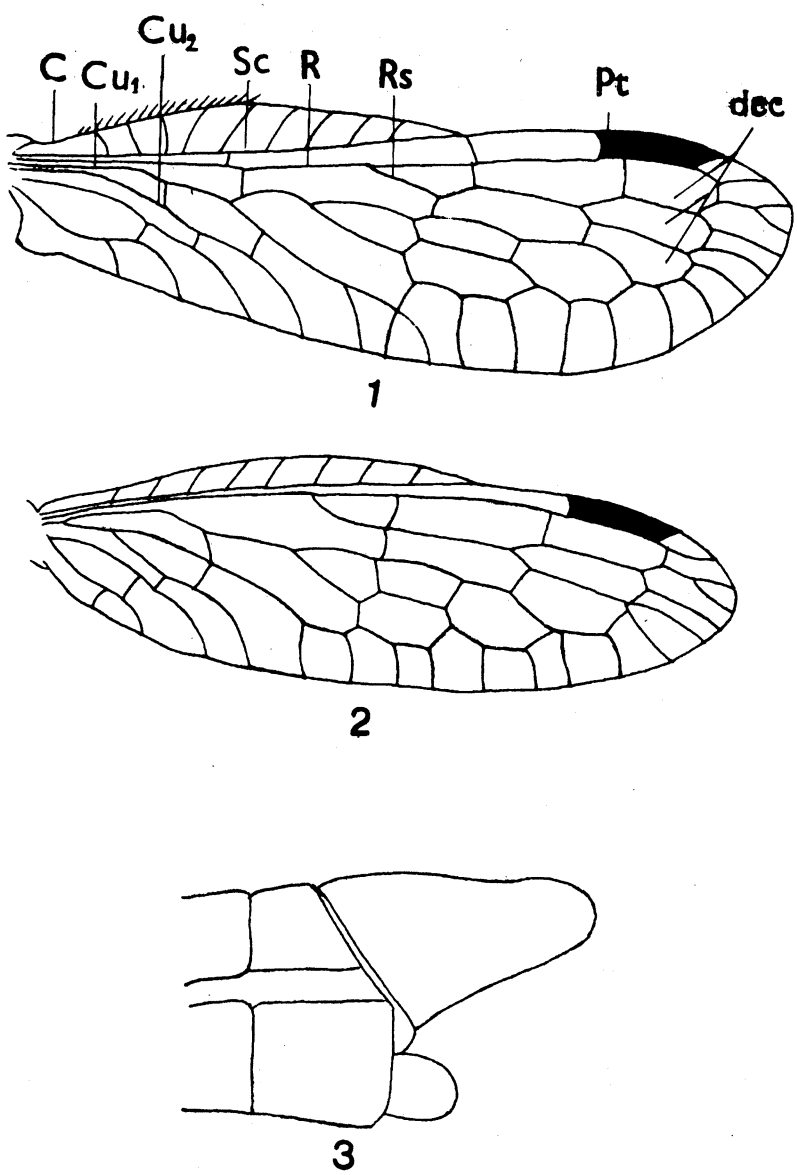


Fig. 1-3. *Protohermes arunachalensis*, **1.** tip of abdomen showing male genital armature, dorsal; **2.** same, ventral; **3.** same, ventro-lateral.

Figs. 4-5. *Corydalus territans*, **4.** tip of abdomen showing male genital armature, ventral; **5.** same, dorsal (Figs. 1-5, after Ghosh, 1991).

PLATE 33
(Figs. 1-3)



Figs. 1-3. *Inocellia crassicornis*, **1.** right forewing; **2.** right hindwing; **3.** tip of abdomen, lateral (Figs. 1-2. after Schneider, 1843).

PLATE A
(Figs. 1-4)

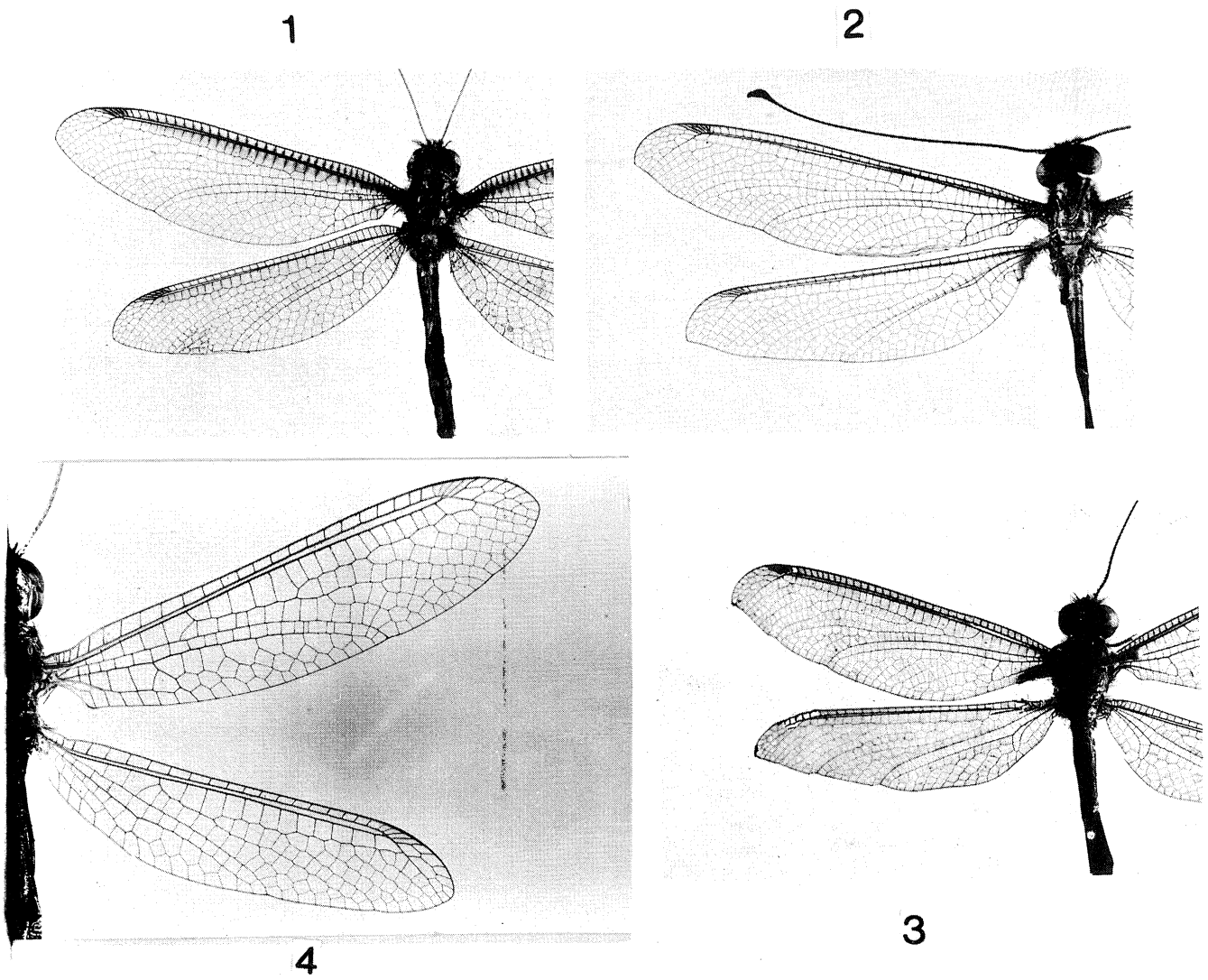


Fig. 1-4. **1.** *Acheron trux loquax*, showing body, left fore- and hindwings in female. **2.** *Acheron trux loquax*, showing left antenna, fore- and hindwings, body in male. **3.** *Acheron trux trux*, showing body left fore- and hindwings. **4.** *Suphalomitus verbosus*, showing body, right fore- and hindwings.

PLATE B
(Figs. 1-4)

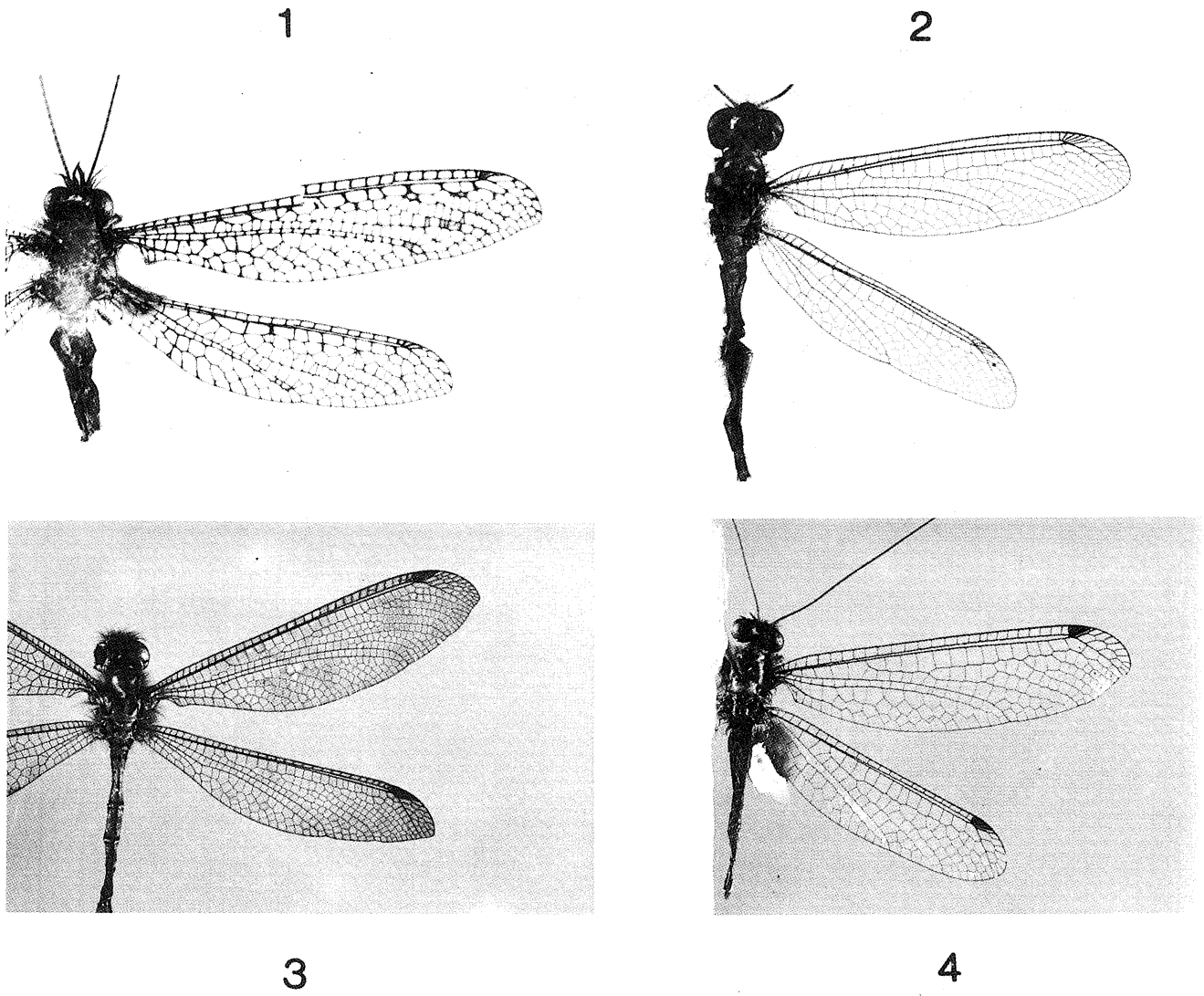


Fig. 1-4. **1.** *Idricerus decrepitus*, body right fore- and hindwings. **2.** *Ascalaphus prothoracicus*, body, right fore- and hindwings. **3.** *Hybris angulata*, body, right fore- and hindwings. **4.** *Suhphalacsa orsedice*, body, right fore- and hindwings.

PLATE C
(Figs. 1-4)

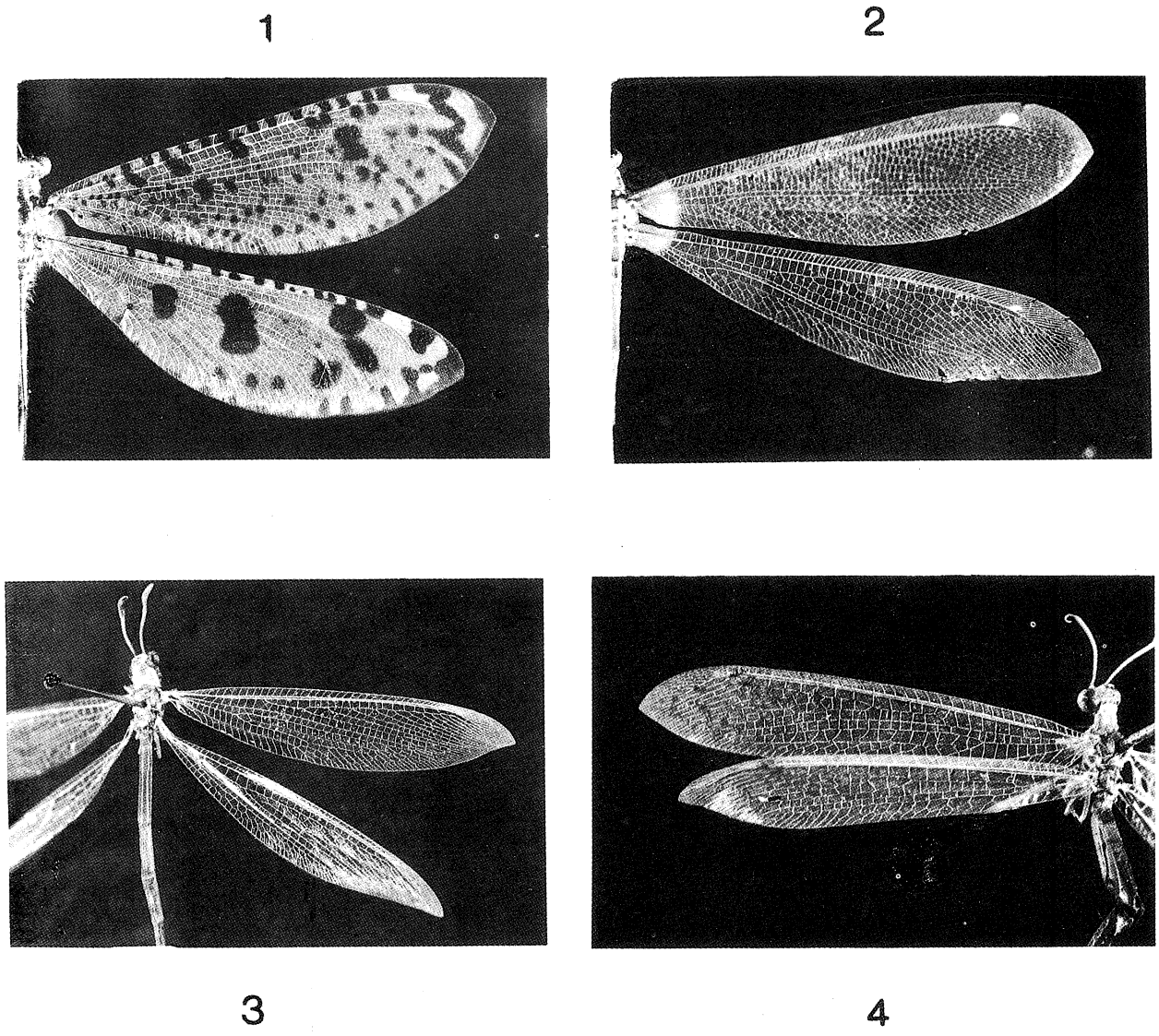
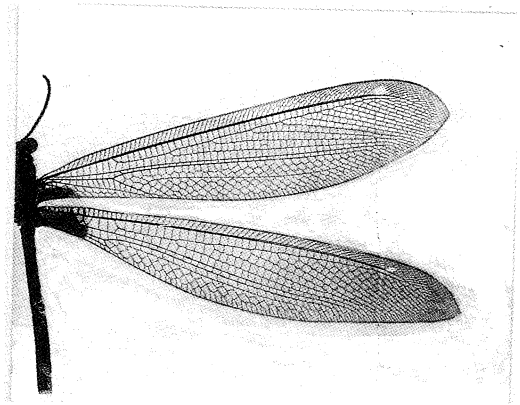


Fig. 1-4. **1.** *Palpares pardus*, right fore- and hindwings. **2.** *Hagenomyia sagax,* fore- and hindwings. **3.** *Creoleon griseus*, right fore- and hindwing. **4.** *Distoleon audax,* left fore- and hindwings.

PLATE D
(Figs. 1-3)



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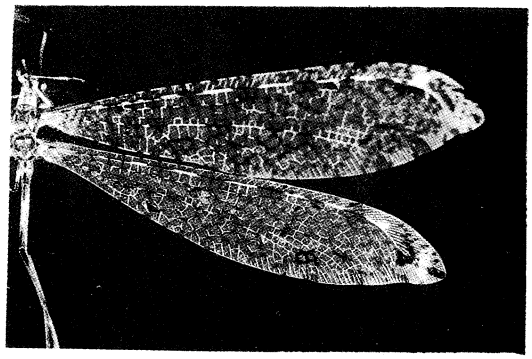

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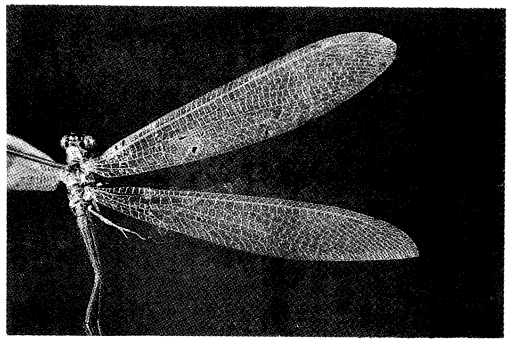
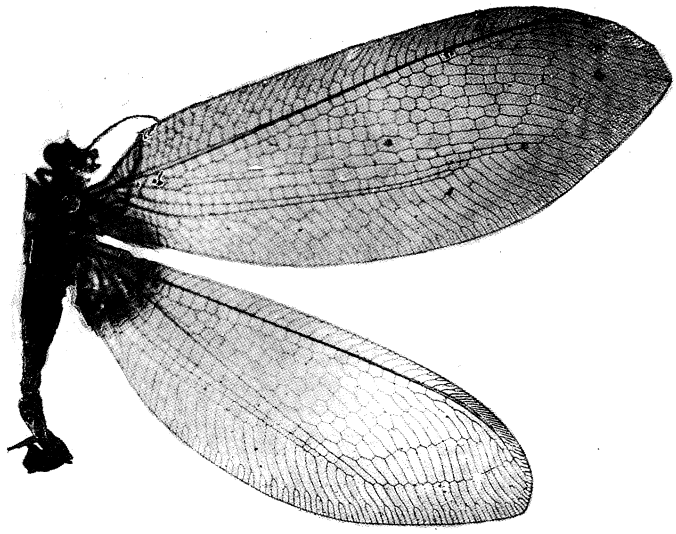


3

Fig. 1-3. **1.** *Hagenomyia jamduarensis*, right fore- and hindwings. **2.** *Gatzara jubilaea*, right fore- and hindwings. **3.** *Myrmeleon clothilde*, right fore- and hindwings.

PLATE E
(Figs. 1-2)



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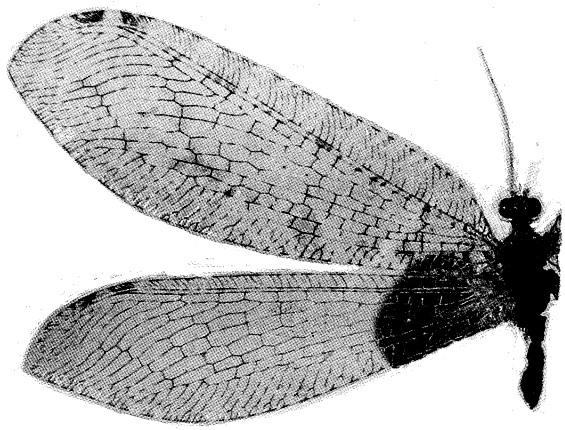
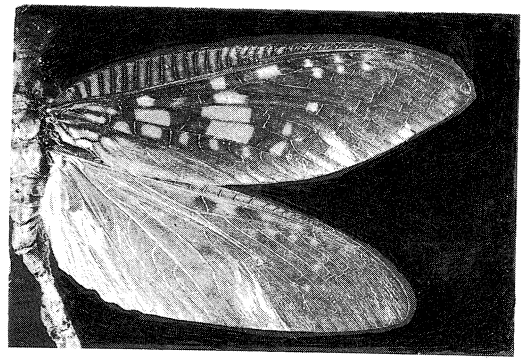


2

Fig. 1-2. **1.** *Hyposmylus punctipennis,* right fore- and hindwings. **2.** *Spilosmylus darjeelingensis* sp. nov., left fore- and hindwings.

PLATE F
(Figs. 1-3)



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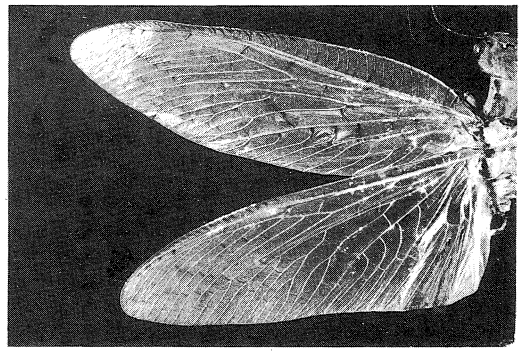

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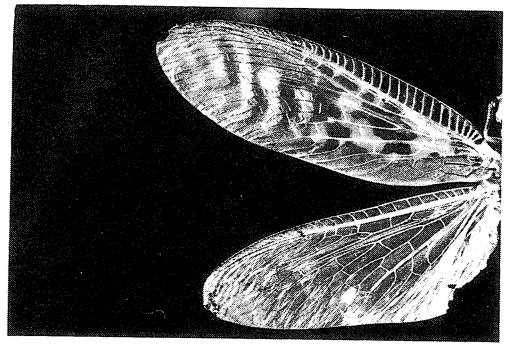

3

Fig. 1-3. **1.** *Corydalus territans*, showing right fore- and hindwings. **2.** *Neoneuromus latratus latratus*, showing left fore- and hindwings, **3.** *Protohermes arunachalensis*, showing left fore- and hindwings.

PLATE G
(Fig. 1)

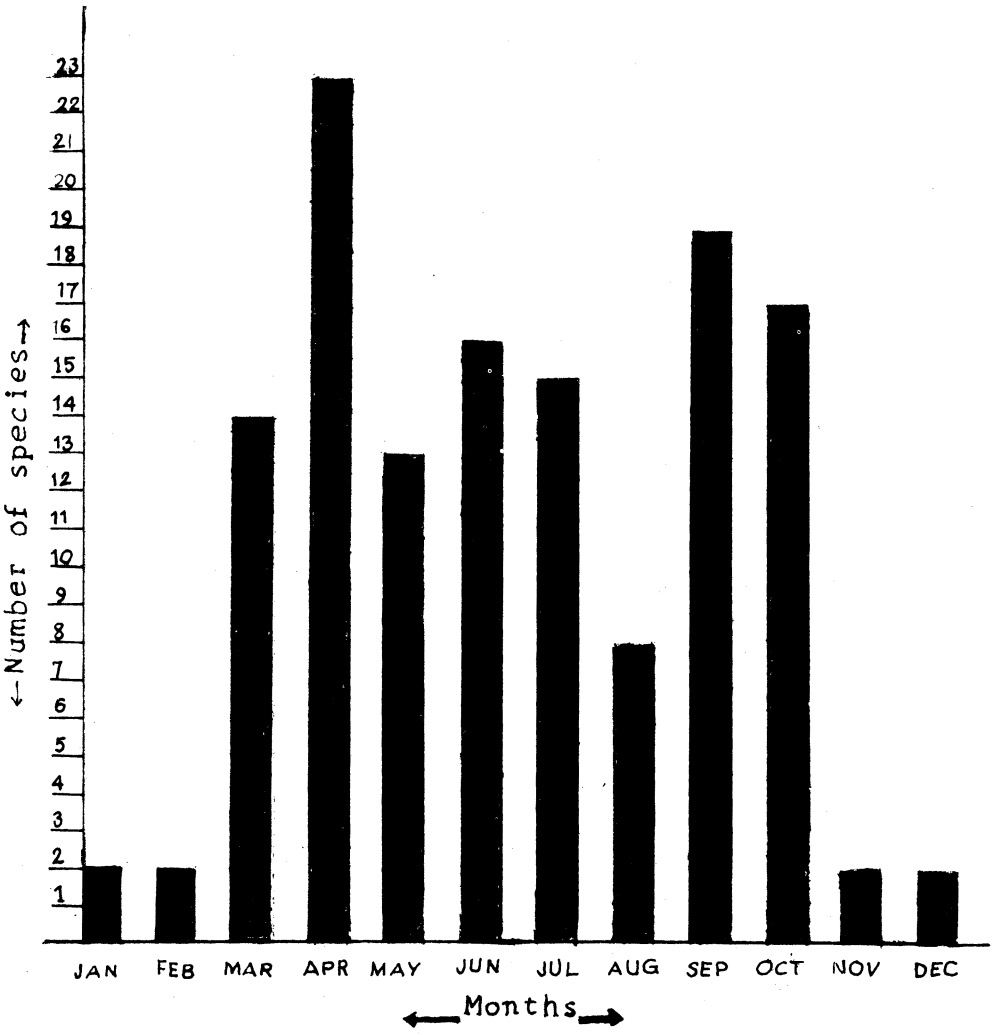

Fig. 1. Barchart showing occurrence of species month-wise as per collection data.

Bibliography of the Neuropterida

Bibliography of the Neuropterida Reference number (r#):
11664

Reference Citation:
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