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Contribution to the taxonomical studies of Neuroptera  
(Suborder Planipennia) from Eastern India  
1. Family Myrmeleontidae

by  
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## INTRODUCTION

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.

The taxonomic study of the group has received so far less attention from the Indian subregion, since no consolidated work on the fauna particularly from eastern India has been published excepting for a few stray papers. Keeping in view, the present study has been envisaged to provide a comprehensive account of the fauna on the collections made by different party members including the author of the Zoological Survey of India. It deals with a brief review on earlier investigation, general taxonomy and distribution coupled with keys to taxa of the material actually examined at the moment. From the examined material, detailed description of new species, redescription of known forms, wherever necessary, morpho-variations and new locality records have been incorporated. Over and above, the text has been suitably illustrated and the literature review of different taxa, marked asterisk (\*) including five new combinations of species studied earlier by the author, has been included due to the lack of relevant material for study. It is also accompanied by a table showing the distribution of the species in eastern India and also in different Zoogeographical realms of the world. It is also not out of place to mention here that the pattern of distribution as shown in the text, has mostly been oriented on the basis of the ranges covering, rather from west to east of the globe.

## EARLIER INVESTIGATION

The Neuropteran fauna from India with particular reference to the family Myrmeleontidae is far from being well known. The work, whatever known till date, is mainly based on the scattered account rendered by various workers including Westwood (1848), Walker (1853, 1858), Needham (1909), Banks [1911a, 1913(a-c)-1914, 1927, 1931, 1939-41], Navas [1912(a-b), 1914-1915, 1923-1924, 1929(a-b)-1933], Dover (1922), Ghosh & Sen (1977) and Ghosh [1977(a-b), 1980(a-b), 1981]. Amongst a total of 106 species reported by these workers only 31 are so far known to occur in the eastern Peninsular and Himalayan sectors.

## ABBREVIATIONS USED

A = Anal veins; ant. Soc. = Antennal socket; bc = Basal cardo; BL = Banksian line; C = Costa; cl = Claw; clp = Clypeus; coll = Collector; Cu = Cubitus; Cu<sub>1</sub> = Cubitus anterior; Cu<sub>2</sub> = Cubitus posterior; Cup = Basal fork of cubitus; cx = Coxa; dc = Distal cardo; 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; la = Lacinia; lb = Labrum; lbp = Labial palpus; Loc = Locality; M = Media; M<sub>1</sub> = Anterior media; M<sub>2</sub> = Posterior media; md = Mandible; msc = Mesoscutum; msct = Mesoscutellum; mtsc = Metascutum; mtscl = Metascutellum; mxp = Maxillary palpus; ped = Pedicel; plm = Palpomere; pm = Paramere; pn = Pronotum; psc = Prescutum; Pt = Pterostigma; R = Radius; Rs = Radial sector; s = Scape; Sc = Subcosta; sp = Spur; st = Stipes; tar = Tarsus; tr = Trochanter; v = Vertex.

## GENERAL DISTRIBUTION

The present neuropteroid material of the family Myrmeleontidae represented by 45 species in 21 genera have an important bearing in respect of both intra- and extra-oriental pattern of distribution. Of these, 18 species in 12 genera have been reviewed from literature (*vide* Systematic account and Table). In comparison to the global

fauna the number of species from the region is much less, reaching only about 4%. Hence, it is imperative to explore fauna to a further extent from the area concerned.

To start with the genera under review, all of them are common in the Oriental and Ethiopian region and 70% are present in the Palaeartic. Only one genus is rather cosmopolitan in distribution. Quite a few, which are apparently absent from one or other Zoogeographic regions of the world, include 2 each from the Papuan and Hawaiian, 3 each from the Malagassic and Australian and one each from the Nearctic and Neotropical regions. On the contrary, all the species except three are confined to the Indian subregion of the Oriental region. The element i.e. *Creoleon griseus* (Klug) shows, however, further extension to the west upon the Ethiopian and Palaeartic regions of the globe, though it is restricted in the peninsular belts of India, while *Myrmecaelurus acerbus* (Walker) is so far known to extend from the Palaeartic, barring Africa, upto India including the north-west Himalayan, western, northern and eastern peninsular belts. One more species i.e., *Stiphronera inclusa* (Walker), is hitherto known also from Himachal Pradesh, Sikkim and the Malayan subregion of the Oriental region.

#### 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.

## EXTERNAL MORPHOLOGY AND TERMINOLOGY

Some of the morphological features, relevant to the present study are given below. Different authors used different terminologies in respect of wings and male and female genitalia. In the present study, the terminology of the wing venation is followed basically after Markl (1954) who made an excellent and invaluable treatment of the comparative morphology of wings of the ant lions, and also the terminology adopted by Adams (1956) has been referred to in the note. Regarding the terminology with reference to the male and female genitalia, Tjeder (1970) has been consulted.

The antlions are small, medium sized or sometimes large and soft-bodied insects. The body of this insect is divisible into head, thorax and abdomen, the account of which is rendered hereunder.

## HEAD

Head (Fig. 1): Hypognathus with biting mouth parts. Vertex (v) (Fig. 9): Arched dorsally. Frons (fr.) (Fig. 1): Separated laterally from the genae by frontal sutures and anteriorly from the clypeus by the clypeo-frontal suture. Clypeus (clp) (Fig. 1): Divided into a large postclypeus and a smaller anteclypeus. Labrum (lb) (Fig. 2): Lies in front of the clypeus and narrower than it.

Mouth parts (Figs. 3-5): Formed of a pair of well-developed and chitinised mandibles (md) (Fig. 3); a pair of maxillae (Fig. 4), each consisting of cardo (dc, bc) stipes (st), galea (ga), lacinia (la) and five segmented palpus (mxp); a labium (Fig. 5) consisting of submentum, mentum (m), prementum (pm) and a pair of 3-segmented palpi (lbp), each of which sometimes contains palpomere (plm) with a sensory opening in the distal segment.

Compound eyes (e) (Fig. 1): Large, prominent, widely separated and placed laterally on either side of the epicranium.

Antennae (Figs. 6 & 7): Short, clavate and divisible into three regions, viz., scape or first segment, pedicel (ped) or second segment and flagellum (fl) composed of the remaining segments.

## THORAX

Thorax (Fig. 9): Usually with three well-defined segments, viz., pro-, meso- and metathorax; the first being elongated; the second and third distinct, but sometimes not sharply demarcated.

Wings (Figs. 10 & 11): Two pairs, usually subequal or hyaline, membranous and at rest held vertically over dorsum; sometimes variably clouded and with or without spots, but with marginal hairs. Venation: Longitudinal veins hairy and generally with furcations at margin; crossveins numerous; costa (C); with numerous simple or forked veinlets, sometimes connected by cross-bars; costal area broad or narrow and with pronounced or ill-defined pterostigma (Pt.); subcosta (Sc): a strong vein joining with the radius at pterostigma and then continuing as a combined vein; radius (R): long, running close to Sc and fusing with it apically; radial sector (Rs): arising near the base with a number of obliquely descending branches; media (M): with two branches,  $M_1$  &  $M_2$  in forewing, but the branches not represented in the hind pair; cubitus (Cu): forking twice, first into basal  $Cu_1$  and  $Cu_2$  in fore wing and, only once in hindwing, giving rise to  $Cu_1$  and  $Cu_2$ ; anal veins (A): 3, viz., 1A, 2A and 3A; the first sending quite a number of branches to the posterior margin and the last two either simple or forked; humeral vein: extending basally from Cu upto R across M; radial cross veins: arising before Rs; hypostigmatic cell (Hsc), long and subapical being formed by Sc + R and  $Rs_2$ ; banksian line (BL) the anterior one being formed by the obliquely descending branches of Rs and the posterior one, by the pectinate series of the descending branches of Cu; gradate cross veins: costal gradates as cross veins connecting the costal veinlets in the costal space before Pt., the apical gradates as crossveins joining the branches springing from the combined vein, Sc + R, the outer gradates as Cross veins paralleling the outer margin and connecting the branches of Rs just proximal to the base of terminal forks and the longitudinal gradates as cross veins extending along the area between Hsc and Bl.

Note: Adams (1956) homologised the radial crossvein with presectoral cross vein and Rs with Rs + MA in both wings, while

in the hind wing he (*loc. cit.*) considered M as MP and IA & 2A as CuA<sub>2</sub> and Cup + A<sub>1</sub> respectively.

Legs (Fig. 8): Well developed, slender or stout and consisting of coxa, trochanter, femur, tibia and tarsus; fore coxae widely separated but coxae of the remaining pair more closely approximated to the main body of the thorax; tibiae generally with spurs; tarsi 5-segmented sometimes provided with claws.

#### ABDOMEN

Abdomen: 10-segmented, long and narrow; first segment short; segment 2-8 well developed; segments 9-10 modified in various ways; with 8 pairs of spiracles on segments 1-8.

Male genitalia (Figs. 12 & 13): Phallic structures usually situated between anus and 9th sternite; gonarcus (gn): a predominant structure of the phallic complex situated as an arched sclerite and provided with a small hood-like structure, the mediuncus at its apex; parameres (pm) loosely articulated with gonarcus and sometimes produced in the form of hooks; ectoproct: appearing laterally as a single large lateral plate without process.

Female genitalia (Fig. 14): Frequently with two pairs of gonapophysis, viz., gonapophysis lateralis (gl) and gonapophysis posteriores (gp); spermatheca: usually strongly sclerotised, pigmented and tube-like; ectoproct: laterally appearing as a plate-like structure.

#### SYSTEMATIC ACCOUNT

##### Key to the Subfamilies of the family *Myrmeleontidae*

1. Cup in forewing long, free and terminating at the posterior margin of wing.....Palparinae Banks
- Cup in forewing short or sometimes long and fused with 1A in its course.....2
2. In hindwing M, Cu and 1A running parallel atleast for some distance; Cu without distinct fork.....Echthromyrmicinae Holzel
- In hindwing M and Cu but not 1A running parallel; Cu with distinct fork.....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 (a) PALPARINI

The tribe is readily recognised by the pronotum very much wider than long, wings highly punctate, the hind pair having crossveins connecting 1A 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 sub-region, of which all are presently dealt with.

Key to the genera of the tribe *Palparini*

1. Two or more series of costal cells near the wing base.....*Stenares* Hagen  
One series of costal cells extending upto pterostigma.....2
2. Wings heavily marked; distance between bases of antennae not more than their basal diameter; larger species with body-length not less than 50 mm.....*Palpares* Rambur  
Wings not so heavily marked; distance between bases of antennae more than their basal diameter; smaller species with body-length less than 40 mm.....*Tomatares* Hagen

Genus 1. *Stenares* Hagen

1866. *Stenares* Hagen, *Stettin. ent. Ztg.*, 27: 372.

Type-species: *Myrmeleon hyaena* Dalman

*Characters*: Pronotum: much broader than long; wings: heavily marked; subcostal field without crossveins; two or more series of cells along most of the costal length of the wing; hind wing: with

4 or more crossveins before origin of Rs: 1A running into the cubital fork and not connected directly with the hind margin but to postanal by a series of crossveins.

*Distribution:* Western and Eastern Africa, Israel and India.

*Remarks:* The genus comprise 4 Indian species of which only one is presently dealt with.

### 1. *Stenares hyaena* (Dalman)

1823. *Myrmeleon hyaena* Dalman, *Analect. ent.*, p. 89.

1866. *Stenares hyaena*, Hagen, *Stettin. ent. Ztg.*, 27: 372.

1972. *Stenares hyaena*, Holzel, *Beitr.naturk.Forsch.SüdwDtl.*, 1: 6.

*Characters:* Body: black and stout; vertex: with oval greyish black spot at middle and several black spots laterally; pronotum: much broader than long with a testaceous stripe at the middle and a black dot on each side of it; meso-and metanotum: with irregular and interrupted stripes on each side; wings: obliquely truncate and with numerous transverse veinlets at tip; pterostigma whitish, small and indistinct; two rows of costal cells formed by the transverse veinlets from base to pterostigma; forewing: completely covered with dark brown dots, larger ones of which are placed towards the base; dark brown streaks on the disc and small spots on hind border also present; hindwing; shorter than forewing; pale brown towards tip; a pale brown interrupted band near middle and some dark brown spots along hind border besides several other streaks and spots in different regions; legs: very stout; spurs of hind tibiae much curved and longer than 1st joint of tarsus.

*Remark:* The species is represented by only one subspecies from India which is dealt with hereunder.

### 1. *Stenares hyaena clara* Navas

1932. *Stenares hyaena clara* Navas, *Memorie Accad. pont., Nuovi Lincei.*, (11) 16: 951.

*Redescription:* (Figs. 19-20): Frons: with black, wavy lines clypeus and labrum: yellow; the latter with brown hairs; mandible and maxillary palpus: brown; vertex: elevated, with a short, black,

median longitudinal stripe and several rounded black spots all over; antenna: black; pronotum (Fig. 19): yellow and wider than long with a median broad longitudinal and short stripe coupled with a black spot on each side; long bristles on the antero-lateral and postero-lateral corner and also at the middle of lateral margins; mesonotum: with a median longitudinal stripe continuing upto the metanotum; on mesoscutum the median stripe curving round its anterior portion and continuing backward for a short distance on each side and some irregular spots also present on each side of the disc; with long black hairs, but mesoscutum and scutellum with long, wooly and white hairs; metanotum: the metascutum with a longitudinal brown spot at the lateral margin and an oblique quadrate spot on each side of the anterior margin; metascutum & scutellum with long, wooly-white hairs; wings: long with apex subacute; forewing: all veins and crossveins yellow with brown dots and shades; narrow brown stripes at the end of M and  $Cu_1$  and also at the junction of  $Cu_1$  and  $Cu_2$ ; two rows of costal cells a little beyond white pterostigma which is not prominent; veins beyond pterostigma forked once or twice and veins ending near the apical half of hind margin also forked; hypostigmatic field brown at apex; 18 cells before origin of Rs, being formed by crossveins and transverse veinlets; Rs with 6 branches; hindwing: shorter than forewing; several irregularly scattered dark spots before pterostigma, on apical part of hypostigmatic field beyond pterostigma and at apex, several spots on hind margin at a short distance from the base; two rows of costal cells; 6 cells before Rs; leg: with black and white bristles; spurs of posterior tibiae equal to the two basal tarsal segments taken together; abdomen: mainly black with yellow patches and black and white hairs: tip of abdomen in female as in fig. 20.

*Measurements:* 2 ♀ ♀ : length of body, 46—52 mm; of forewing, 63-66.5 mm; of hind wing, 60-62 mm.

*Material examined:* 1 ♀ : India: Orissa: Hamilton garden, Mayurbhanj, 17.ii.73. coll. S. K. Gupta and party. 1 ♀ : Orissa: Deogarh camp compound, Sambalpur, 23.vi.73. coll. T. K. Sen and party.

*Distribution:* India: Orissa.

*Remarks:* Navas (1932) did not mention the detailed locality of the species which he described from India. Further, in absence of the known distributional records at hand from India proper, it has not been possible for the author to incorporate in the table excepting for Orissa whence it is supposed to constitute new locality record.

## Genus 2. **Palpares** Rambur

1842. *Palpares* Rambur, *Hist. nat. Ins. Neuropt.*, p. 365.  
 1913. *Palpares*, Banks, *Ant. ent. Soc. Am.*, 6: 171.  
 1972. *Palpares*, Holzel, *Beitr.naturk.Forsch.Südwdtl.*, 1: 6.

Type-species: *Myrmeleon libelluloides* Latreille

*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 & Eastern Africa, Lebanon, Yemen, Iran, Afghanistan, Pakistan and India.

*Remarks:* The genus comprises of about 13 species from India, of which only 4 are presently dealt with.

### Key to the species of the genus **Palpares** Rambur

1. A large spot over Cu in hindwing.....3  
 No such spot as above.....2
2. An elongated spot present at the middle of hindmargin of hindwing; band on M in hindwing not running across.....*tigroides* (Walker)  
 Such spot lacking; band on M in hindwing running across; forewing plainly sinuate at the margin; stigmal spot projecting towards the tip of band on M in forewing.....*contrarius* (Walker)
3. Presence of two parallel stigmal bands or spots in hindwing; M in hindwing connected with a basal spot which runs across.....*patiens* (Walker)

One stigmal band either entire or band broken into a series of spots; no spot behind R; stigmal band extending outward or curved inward.....*pardus* (Rambur)

## 2. *Palpares tigroides* (Walker)

1859. *Myrmeleon tigroides* Walker, *Trans. R. ent. Soc. Lond.*, 5: 187.  
 1909. *Palpares tigroides*, Needham, *Rec. Indian Mus.*, 3: 200.  
 1913. *Palpares tigroides*, Banks, *Ann. Ent. Soc. Am.*, 6: 189.

*Additional characters*: Labrum and clypeus: yellow; frons: brownish; vertex: with a narrow transverse stripe anteriorly and a median black stripe; pronotum: yellow, with 3 black stripes; meso-and metanotum: with woolly hairs; concolorous with pronotum; forewing: with 9 crossveins before Rs, 5 of which are connected with the transverse veinlets at middle; Rs originating a little beyond the cubital fork; hindwing: 5 crossveins before Rs; legs: dark brown; spur of hind tibia equalling to the first two tarsal segments taken together; abdomen brownish with white hairs.

*Measurements*: 1 ex: Length of forewing, 60 mm; of hindwing, 58 mm.

*Material examined*: 1 ex. (abdomen damaged): India: Bihar: Dalkhola, Purneah, Date nil, coll. C. A. Paiva.

*Distribution*: India: Bihar.

## 3. *Palpares contrarius* (Walker)

1853. *Myrmeleon contrarius* Walker, *Cat. Brit. Mus. Neur.*, 2: 301.  
 1868. *Palpares contrarius*, MacLachlan, *J. Linn. Soc.*, 9: 274.  
 1909. *Palpares contrarius*, Needham, *Rec. Indian Mus.*, 3: 200.  
 1921. *Palpares contrarius*, Dover, *Rec. Indian Mus.*, 22: 392.

*Additional characters* (figs. 26-27): Labrum and clypeus: pale; frons: with a brownish tinge; antenna: black; vertex: with two black bands; a median black stripe extending from the hinder-region up to metanotum; thorax (fig. 26): with three black stripes; wings: hyaline and pale brown: forewing: first spot at base restricted in between the branches of Cu; hindwing: first spot at base irregular; leg: apical tarsal segment equal to all

segments taken together; abdomen: brown, but darker towards apex; tip in male, as in fig. 27.

*Measurements*: ♂ : length of body, 57 mm; of forewing, 54 mm; of hindwing, 51 mm.

*Material examined*: 1 ♂ : India: Orissa: Poshighat, Mayurbhanj, 20.iii.73, coll. S. K. Gupta & party.

*Distributions* India: Uttarpradesh (Mussoorie), Karnataka, Maharashtra, Orissa (Khurda and Mayurbhanj); Sri Lanka.

#### 4. *Palpares patiens* (Walker)

1853. *Myrmeleon patiens* Walker, *Cat. Brit. Mus. Neur.*, 2: 305.

1868. *Palpares patiens*, MacLachlan, *J. Linn. Soc.*, 9: 275.

1913. *Palpares patiens*, Banks, *Ann. ent. Soc. Am.*, 7: 188.

1921. *Palpares patiens*, Dover, *Rec. Indian Mus.*, 22: 398.

*Additional characters*: Labrum, clypeus and frons: brownish-yellow; labial and maxillary palpi: dark brown; vertex: with some pale brown spots; pronotum: hairy, yellow, with a median and lateral black stripes; a transverse middle ridge with rows of white hairs; meso- and metanotum: blackish; forewing: with 6 crossveins before Rs, of which two are mutually connected at middle by transverse veinlets; Rs having 12 branches originating at a little distance beyond the cubital fork; hindwing: 4 crossveins before Rs having 12 branches; legs: dark brown; spur of hind tibia almost equalling to the first two tarsal segments taken together; claws black.

*Measurements*: ♀ : Length of body, 57 mm; of forewing, 69 mm; of hindwing, 65 mm.

*Material examined*: 1 ♀ : India: Orissa: Barkuda Island, Chilka Lake, 15-22.vii.16. coll. Gravely and Annandale.

*Distribution*: India: "North India", West Bengal and Orissa.

#### 5. *Palpares pardus* (Rambur)

1842. *Myrmeleon pardus* Rambur, *Hist. Nat. Ins. Neur.*, p. 375.

1853. *Myrmeleon pardus*, Walker, *Cat. Brit. Mus. Neur.*, 2: 308.

1868. *Palpares pardus*, MacLachlan, *J. Linn. Soc.*, 9: 275.

1909. *Palpares pardus*, Needham, *Rec. Indian Mus.*, 3: 200.

1921. *Palpares pardus*, Oover, *Rec. Indian Mus.*, 22: 398.

*Redescription* (figs. 18, 28-31): Frons, clypeus and labrum: pale brown; gena, maxillary and labial palpi: brown; mandible: dark brown; vertex: brown, hairy, arched dorsally and divided longitudinally by a median suture; antenna: brown, with long, hairs at the base and scape; pronotum (fig. 28): broader than long, hairy, with a median and a narrow lateral black stripes; meso- and metanotum: with 3 interrupted black stripes and long white dense hairs; pleura: black; forewing: with several quadrate brown spots extending up to R; brown dots at base and along hind margin besides a few large brown spots on disc; an undulating brown band at tip; 7 crossveins before Rs having 14 branches; Rs much beyond the cubital fork; hindwing: with a few large brown spots on disc and small dots on hind margin; 6 crossveins before Rs having 14 branches; single pterostigmal band extending outward or curved inward or broken into a series of spots; a large spot on Cu; legs: brown, but coxae and tarsi blackish and with numerous black setae; spurs dark brown, not much curved and equal to the 4 tarsal segments taken together; the last tarsal segment very long; abdomen: with the 1st and 3rd segments black, others testaceous; all the segments with black setae, but the 2nd and 3rd with long white hairs; apex in male with 2 long appendages and black bristles (Fig. 31); genitalia in male, as in figs. 29-30 and tip in female, as in fig. 18.

*Measurements*: ♂♂: length of body, 40-48 mm; of forewing, 49.5-53 mm; of hindwing, 47-51 mm; ♀♀: length of body, 50 mm; of forewing, 60 mm; of hindwing, 58 mm.

*Material examined*: 1 ♂: India: Orissa: Angul, Puranagar, 29.ix.72; 1 ♂, Angul, Karatpeta, 29.ix.72; 2 ♂♂, Angul, Nisa, 1.x.72, coll. K. Rai and party; 1 ♂, Sambalpur, 6.xi.72, coll. J. M. Julka and party; 1 ♀, Puri, 1 km. West of Balugaon Rly. Stn., 17.iii.74, coll. S. K. Ghosh.

*Distribution*: India: Maharashtra, South India, "North India", Orissa, West Bengal and Sikkim.

*Remark*: The species is very common, occurring in both the Peninsular and Himalayan sectors of India.

Genus 3. **Tomatares** Hagen

1866. *Tomatares* Hagen, *Stettin. ent. Ztg.*, 27: 372.

Type-species: *Myrmeleon pardalis* Fabricius

*Characters*: Body: small; antenna: distance between the basal joints of respective counterparts more than the diameter of basal segment; pronotum: much broader than long; wings: heavily marked; forewing: with only one series of costal cells, but two rows near pterostigma; four separate anal veins; hindwing: with 4 or more crossveins before the origin of Rs; IA connected with 2A by a series of crossveins; legs: tibial spurs as long as the two basal tarsal joints taken together; abdomen: appendix superiores long and forcep-like.

*Distribution*: Eastern & Western Africa; India, Western Malaysia, Indonesia and Papua.

*Remarks*: Amongst 3 Indian species, only one is presently dealt with.

6. **Tomatares pardalis** (Fabricius)

1781. *Myrmeleon pardalis* Fabricius, *Spec. Ins.*, p. 398.  
 1787. *Myrmeleon pardalis*, Fabricius, *Mand. Ins.*, p. 249.  
 1793. *Myrmeleon pardalis*, Fabricius, *Ent. Syst.*, 2: 92.  
 1793. *Myrmeleon pardalis*, Gmelin, *Syst. Nat.*, Ed. 13: 2643.  
 1825. *Myrmeleon pardalis*, Olivier, *Encycl. Méthod.*, 8: 122.  
 1853. *Myrmeleon compositus* Walker, *Cat. Brit. Mus. Neur.*, 2: 397.  
 1868. *Tomatares pardalis*, MacLachlan, *J. Linn. Soc.*, 9: 281.  
 1884. *Tomatares pardalis*, MacLachlan, *Entomologist's mon. Mag.*, 20: 184.  
 1909. *Tomatares compositus*, Needham, *Rec. Indian Mus.*, 3: 200.  
 1910. *Tomatares pardalis*, Weele, *Notes Leyden Mus.*, 31: 17.

*Additional characters* (figs. 21-25): Frons: black; clypeus and labrum: pale; gena: with a narrow black stripe; maxillary palpi: pale yellow to dark brown; vertex (fig. 21): anterior part with a transverse 'W'-shaped and posterior part with a transverse and nearly straight black band, the two being connected by a longitudinal and median black stripe; forewing: with costal crossveins between pterostigma and base mostly simple except two being forked; hindwing: with a prominent golden brown hairy lobe at axillary angle; legs: yellow, with the distal part

of coxae, tibiae and tarsi black; abdomen: tip and genitalia in male and female, as in figs. 22-25.

*Measurements*: ♀ : length of body, 30.5-32 mm; of forewing, 38.5—40 mm; of hindwing, 35—37 mm; ♂ : length of body, 32 mm; of forewing, 31 mm; of hindwing, 28.5 mm.

*Material examined*: ♂ : India: Orissa: near old circuit house, Sundargarh, 25.x.72, coll. J. M. Julka and party; 1 ♀ : Bihar: Kankarisal, 1 km. east of Chakulia village, Chhotanagpur, 26.x.68, coll. Raj Tilak.

*Distribution*: "North India", Bihar, West Bengal and Orissa.

#### Subfamily (B) ECHTHROMYRMICINAE

The subfamily has been erected by Holzel (1972) It is so far known from the Palaearctic, Ethiopian and Oriental regions of the globe and, represented by only one tribe which is dealt with hereunder.

#### Tribe (b) ECHTHROMYRMICINI

The tribe erected by Markl (1954), is readily recognised by the long labial palpus, origin of Rs near the base of both wings, of  $M_2$  arising after the cubital fork,  $Cu_1$  considerably long and fusing with 1A, long 2A and 3A with several branches in the forewing,  $Cu_2$  not longer than a cross vein but meeting 1A and 2A and 3A distinct in the hindwing. It comprises only one genus from all over the globe, which is dealt with hereunder.

#### Genus 4. **Echthromyrmex** MacLachlan

1868. *Echthromyrmex* MacLachlan, *J. Linn. Soc.*, 9: 243.

Type-species: *E. platypterus* MacLachlan

*Characters*: Antenna: basal joint not very long, the basal distance from its counterpart being hardly as long as the diameter of individual joint; pronotum: very short; wings: rather broad; heavily marked and with the costals simple; forewing: 1st branch of Rs arising before the cubital fork;  $Cu_1$  divergent; 1A not running directly to the margin but bent upwards as a long curve;

all branches of 1A connected by crossveins; hindwing; Cu and 1A sinuously parallel for a long distance; cubital fork indistinct; legs: rather short; basal joint of tarsus short and the apical one as long as the other joints taken together; tibiae shorter than femora; spur nearly as long as the basal two tarsal segments taken together.

*Distribution:* Western and Eastern Africa, Saudi Arabia, Afghanistan and India.

*Remark:* Only one species is hitherto recorded from India which is dealt with hereunder.

### 7. *Echthromyrmex orientalis* MacLachlan

1873. *Echthromyrmex orientalis* MacLachlan, *Ann. ent. Belg.*, 16: 143.

*Redescription* (figs. 15-17): Face: yellow; frons: black; vertex: yellow with some irregular black spots; antenna: brown; pronotum (fig. 15): broader than long with 3 black stripes, the middle one being broader than the two lateral ones; meso- and metanotum: black; wings: hyaline, apex dilated and the posterior margin excised near apex; forewing: all longitudinal veins yellow and the brown bands at origin of each crossvein; majority of crossveins either wholly or partially dark brown, a few being yellow; some forked veins before the orange-yellow pterostigma and others after it; the apical portion and distal half of hind margin clouded with brown particularly on the forked veinlets; costal veinlets simple; 4 crossveins before Rs which is with 6 branches; Cu and 1A parallel; all the branches of 1A connected by crossveins; hindwing: with an irregular brown patch having milky margin across the wing apically; all the longitudinal veins yellow with brown bands at origin of each crossvein which is yellow except some dark brown radial ones; forked veinlets beyond pterostigma; apex and hind margin clouded with brown; 2 crossveins before Rs which is with 7 branches; Cu and 1A parallel; legs: yellow, with scattered black marks; tarsus brown apically; 1st tarsal segment shorter than the apical one which is almost equal to all others taken together; abdomen: black; tip and genitalia in male as in figs. 16-17.

*Measurements:* ♂ ♀ : length of body, 32 mm; of forewing, 43.5 mm; of hindwing, 43.5 mm.

*Material examined:* 1 ♂ : India: Orissa: Deogarh camp compound, Sundargarh, 23.iv.73, coll. T K. Sen and party. 1 ♀ : Chibrakunbla, Koraput, 12.v.66, coll. K. K. Mahajan and party.

*Distribution:* India: Goa and Orissa.

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

### Subfamily (C) 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 5 tribes are dealt with and keyed, while a couple reviewed from literature, as hereunder.

#### Key to the tribes of the subfamily *Myrmeleontinae*

1. In forewing, Rs arising near the base; ♂ with axillary plate; hindwing almost with two radial cross veins,.....Dendroleonini Navas  
In forewing, Rs not arising near the base, but almost at the bifurcation of Cu.....2
2. Inner radial field of hindwing with 3 or more crossveins.....3  
Inner radial field of hindwing with only 1 cross vein.....Distoleonini Banks
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; ♂ with axillary plate; stout and hairy body.....Acanthaclisini Navas  
In hindwing 1A not fused with Cu.....4

4. Anterior banksian line absent in both the wings ; 2A sharply angled with 3A.....**Myrmeleonini Banks**  
 Anterior banksian line present in both the wings ; 2A geniculate and partly coincident with 3A.....**Isoleonini Holzel**

### Tribe (c) MYRMELEONINI

The tribe, erected by Banks (1911 b), 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 *Myrmeleonini*

1. In forewing, Rs arising before the cubital fork.....**Hagenomyia Banks**  
 In forewing, Rs arising much beyond the cubital fork.....**2**
2. In forewing, only a single series of costal cells before the pterostigma.....**Myrmeleon Linnaeus**  
 In forewing, two series of costal cells before the pterostigma.....**Stiphroneura Gerstaecker**

#### Genus 5. **Hagenomyia** Banks

1911. *Nelees* Navas, *Rev. zool. bot. afric.*, 1: 244.  
 1911. *Hagenomyia* Banks, *Ann. ent. Soc. Am.*, 4: 8.  
 1912. *Balaga* Navas, *Russk. ent. Obozr.*, 12: 111.  
 1912. *Baliga* Navas, *ibid.*: 110.  
 1962. *Hagenomyia*, Kuwayama, *Pacif. Insects*, 4 (no. 2): 387.

Type-species: *Myrmeleon tristis* Hagen

*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 the 1st tarsal segment.

*Distribution*: Africa, China, India, Korea, Japan and Australia.

*Remarks*: Markl (1954) synonymized 3 genera, viz., *Nelees*

Navas, *Balaga Navas* and *Baliga Navas*, with the genus *Hagenomyia* Banks. So, all the three Indian species, viz., *Nelees reticulatus* Navas, *Balaga pupillatus* Navas and *Baliga monticola* Navas, may be considered under the genus *Hagenomyia* Banks. Moreover, Esben-Petersen (1913) considered *Myrmeleon sagax* Walker as *Hagenomyia sagax* (Walker). Presently, the description of a new species and also of another indetermined one, is given in addition to the review of one more from literature.

#### Key to the species of the genus *Hagenomyia* Banks

Larger body, with the length of forewing 46 mm; pronotum without any median stripe; region of pterostigma with distinct irregular milk white patch in both wings: 7-8 crossveins before Rs in hindwing.....*Hagenomyia* sp.

Smaller body, with the length of forewing never more than 41 mm; pronotum with a narrow median yellow stripe on upper half; pterostigma white; 4 crossveins before Rs in hindwing.....*jamduarensis*, sp. nov.

#### 8. *Hagenomyia* sp.

*Description:* (figs. 32-33 & pl. I. fig. 2): Labium: yellow; labrum: brown with a dark spot on each side; maxillary and labial palpus: yellow with brown tip; clypeus: yellow with a longitudinal brown stripe; frons: shiny black; gena: yellow; antenna and vertex: black, latter with irregularly wavy corrugations; pronotum (fig. 32): broader than long, with a transverse concavity at middle and long hairs and the antero-lateral sides bearing narrow yellowish marks; meso-and metanotum: black with long hairs; pleura: black; fore-wing (pl. I, fig. 2): broad, brown, narrowed at base and with acute apex; all the veins and cross veins black, except costa which is yellowish; Sc, Cu<sub>1</sub> and Cu<sub>2</sub> with yellow bands; a few costal crossed before pterostigma for about 1/4 of a distance from the base; costal veins forked before and after the pterostigma; bifurcated branches of veins after the pterostigma with transverse veinlets; an irregularly large milk-white spot on pterostigma; 9 crossveins before Rs: hindwing (pl. I, fig. 2): longer than forewing; 7-8 crossveins before Rs; legs: coxa and femur yellow, with white hairs and black bristles;

tibia and tarsus black; tibia with long black bristles; spur of hind tibia as long as the 1st segment of tarsus; claws brown; abdomen: blackish; all segments except the last four segments with long white hairs and short black bristles; tip (fig. 33) with long black bristles.

*Measurements*: ♀ : length of body, 45 mm; of forewing, 46 mm; of hindwing, 50 mm.

*Material examined*: India: 1 ♀ : Meghalaya: Risa colony, Shillong, 4.ix.74, Coll, R. Mathew.

*Distribution*: India: Meghalaya.

*Remarks*: The species approaches to *H. eurystictus* (Gerst.) (= *M. eurystictus*) because of a large milky white spot on the pterostigma. Neither any material nor a good description of *eurystictus* (Gerst.) has been available for comparison. So, for the time being, the material under study could not be determined upto the species level.

### 9. *Hagenomyia jamduarensis*, sp. nov.

*Descriptions* (figs. 34-37 pl. 1, fig. 1): Labrum: brown; clypeus: with an 'U'-shaped black spot, each limb of which being connected by a black stripe running just below antenna; a large squarish and black spot between the black antennae; vertex (fig. 34): with two longitudinal black spots at middle, together with two rounded black spots on either side and just below the first; pronotum: with a narrow median yellow stripe only on the upper half and a broad lateral one throughout; meso- and metanotum: with a median black stripe; wings (pl. I, fig. 1): hyaline, with the apex acute; veins black but Sc and R pale; forewing: with the costals crossed before the white pterostigma; two rows of crossveins beyond the pterostigma, near which the costal veinlets are forked; 9 crossveins before Rs which is with 11 branches; hindwing: narrower than the forewing; 4 crossveins before Rs which is with 13 branches; legs: pale with an elongated black mark on both femur and tibia; spur of hindtibia almost as long as the 1st tarsal segment; 5th tarsal segment longest; abdomen: dark brown with the 1st tergite having a black and pointed

projection on the postero-lateral corner; last four tergites black; tip in male and female and also the genitalia in male, as in figs. 35-37.

*Measurements*: ♂ (Holotype): length of body, 32 mm; of forewing, 32 mm; of hindwing, 32 mm. ♀ (Allotype): length of body, 32 mm; of forewing, 36 mm; of hindwing 38 mm. 2 ♀♀ (Paratypes): length of body, 32 mm; of forewing, 40 mm; of hindwing, 41 mm.

*Material examined*: India: 1 ♂ (Holotype, Z.S.I. Reg. no. 1035/H<sub>12</sub>): India: Assam: Jamduar, 30.vi.73, coll. S. S. Saha and party. 1 ♀ (Allotype, Z.S.I. Reg. no. 1036/H<sub>12</sub>): loc. as for the Holotype, 8.vi.73, Coll. as for the Holotype. 2 ♀♀ (Paratypes, Z.S.I. Reg. no. 1037-1038/H<sub>12</sub>): collection data same as for the Allotype.

*Distribution*: India: Assam.

*Remarks*: This new species closely resembles *Hagenomyia sagax* (Walker) in having small pterostigma in the hindwing, costal veinlets forked and divided by transverse veinlets upto a certain distance from pterostigma towards the base, but differs from it by the presence of several spots on the vertex, markings on the pronotum and last four black abdominal tergites.

#### \*10. **Hagenomyia monticolla** (Navas)

1937. *Baliga monticolla* Navas, *C. R. Congr. int. Zool.*, 12: 1475.

*Distribution*: India: North Bengal (Kurseong).

*Remarks*: Markl (1954) merged the genus *Baliga* Navas with *Hagenomyia* Banks. From the literature review *sensu* Banks (1911) and Navas (1912), it stands to reason to accept Markl's (*loc. cit*) view and so *Baliga monticolla* Navas should be considered as *Hagenomyia monticolla* (Navas).

#### Genus 6. **Myrmeleon** Linnaeus

1967. *Myrmeleon* Linnaeus, *Syst. Nat., Ed.*, 12: 913.

Type-species: *Myrmeleon formicarius* Linn.

*Characters*: Antenna: short, clubbed, widely separated from its counterpart at base and generally shorter than the head and thorax taken together; wings: a single series of costal cells; costal veins simple; Rs originating beyond the 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 the 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 the first; spur of hind tibia nearly equal to the 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 of female; genitalia in male with gonarcus, parameres and mediuncus.

*Distribution*: Cosmopolitan.

*Remarks*: Amongst a total of 18 species so far known from India, one is redescribed, one is described new to science and four are reviewed from literature. Only two are keyed and the species reviewed from literature have not been brought under the key.

#### Key to the species of the genus **Myrmeleon** Linnaeus

Pronotum blackish and without longitudinal black stripe; majority of the veins and crossveins yellow and with brown bands.....*clothilde* Banks

Pronotum yellow and with two longitudinal black stripes at middle; majority of the veins and crossveins pale yellow, but without brown band.....*assamensis*, sp. nov.

#### 11. **Myrmeleon clothilde** Banks

1913. *Myrmeleon clothilde* Banks, *Trans. Amer. ent. Soc.*, 39: 223.

*Redescription*: Frons, genae, clypeus and labrum: yellow; mandible: brown; maxillary palpus: yellow, except the dark brown apical segment; antenna: black; vertex: black and with a

semicircular yellow spot on each side; pronotum: blackish, with yellowish antero-lateral corners and short hairs; meso-and metanotum: black and without hair; wings: clear, hyaline with acute apex; pterostigma white; forewing: all the veins and crossveins yellow, with brown bands and short black hairs; all the costal crossveins simple except the three forked ones before pterostigma; forked veins after pterostigma connected with one another by transverse veinlets; 7 crossveins before Rs which is with 7 branches ending at the hind margin; hindwing: with 5 crossveins before Rs; branches of Rs as in the forewing; legs: fore-and midfemora yellow with apex black; fore-and mid tibiae black excepting for a few yellow patches; tarsal segments yellow with their apices dark brown; hind femur yellow at the basal half and the rest black; hind tibia yellow with the inner side and apex black and, spur shorter than the basal segment; abdomen: black, with concolorous hairs.

*Measurements*: ♀ : length of body, 23.5 mm; of forewing, 29 mm; of hindwing, 27 mm.

*Material examined*: 1 ♀ : India: Orissa: Inspection bungalow, Angul, 1.x.72, coll. K. Rai and party.

*Distribution*: India: Himachal Pradesh, Bihar and Orissa.

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

## 12. *Myrmeleon assamensis*, sp. nov.

*Description* (Figs. 38-40 pl. I, fig. 3): Clypeus and labrum: brownish; maxillary palpus: yellow to fuscous; frons: shiny black; vertex: black with two lateral and two elongated dark spots at middle; antenna: black, with scape yellow distally; pronotum (fig. 38): yellow with two broad longitudinal black stripes; broader than long with rounded antero-lateral corners; meso-and metanotum: black with yellow border; wings (pl. I, fig. 3): hyaline, long, narrow with acute apex and without any marking; costal margin, subcostal veinlets and the crossveins terminating at the hind margin black; all other veins and crossveins pale yellow; Sc with brown bands; pterostigma white and indistinct; forewing: with a few crossveins forked before the pterostigma; 8

crossveins before Rs which is with 11 branches; hindwing: slightly shorter than the forewing; 4 crossveins before Rs which is with 14 branches; legs: brown with black hairs and bristles; hind femur apically dark; 5th tarsal segment in hind tibia almost equal to the first three tarsal segments taken together; abdomen: black, shorter than the wings and with white hairs; tip of the tergites from the 5th onwards yellow; apex and ♂ genitalia, as in figs. 39-40.

*Measurements*: 1 ♂ (Holotype); length of body, 24.5 mm; of forewing, 26.5 mm; of hindwing, 26.5 mm; 3 ♂♂ (Paratypes): length of body, 26 mm; of forewing, 29 mm; of hind wing, 29 mm.

*Material examined*: India: 4 ♂♂ (Holotype, Z.S.I. Reg. no. 1039/H<sub>12</sub> and 3 paratypes, Z.S.I. 1040-1042/H<sub>12</sub>): India: Assam: Raimona, 14.vi.73. coll. S. S. Saha and party.

*Distribution*: India: Assam.

*Remarks*: The species closely resembles *M. berenice* Banks, but can be easily distinguished from it by two black stripes on pronotum, Rs arising before the end of anal vein in forewing, in the number of crossveins before the pterostigma and Rs including that of branches of the latter.

### \*13. *Myrmeleon montanus* Navas

1914. *Myrmeleon montanus* Navas, *Ann. Soc. Sci.*, 38: 234.

*Distribution*: India: North Bengal (Darjeeling).

*Remarks*: Navas (1914) described the species from India. He (*loc. cit.*), however, referred to its allied species, *M. formicareo* Linn., but did not mention the distinguishing features between the two species.

### \*14. *Myrmeleon periculosus* Walker

1853. *Myrmeleon periculosus* Walker, *Cat. Brit. Mus. Neur.*, 2: 337.

*Distribution*: India: Bihar (Pusa).

*Remarks*: The species was described by Walker (1853). Later,

Needham (1909) mentioned this species under the genus *Formicaleo* Leach without assigning any reason for it. Moreover, Walker's (*loc. cit.*) description was rather inadequate and with this insufficient information, it is not possible to provide a meaningful comment on the species.

**\*15. *Myrmeleon pulverulentus* Rambur**

1842. *Myrmeleon pulverulentus* Rambur, *Hist. nat. Ins. Neur.*, p. 392.

*Distribution*: India: West Bengal.

*Remarks*: Rambur (1842) described the species by a few characters. Walker (1853) just quoted the characters given by Rambur (*loc. cit.*) in the list of the species. From such description, it is not possible to make any comment on the species.

**\*16. *Myrmeleon punctulatus* Rambur**

1842. *Myrmeleon punctulatus* Rambur, *Hist. nat. Ins. Neur.*, p. 405.

*Distribution*: India: Orissa (Ganjam dist., Chatrapur) and West Bengal.

*Remarks*: Needham (1909) doubtfully identified the species from Orissa. Similarly, the other remarks as for the preceding species is also applicable here.

**Genus 7. *Stiphoneura* Gerstaecker**

1885. *Stiphoneura* Gerstaecker, *Mitt. naturw. Ver. Neu. Vorpom. u. Rugen*, 16: 91.

Type-species: *Myrmeleon inclusus* Walker

*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 the 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.

### 17. *Stiphroneura inclusa* (Walker)

1853. *Myrmeleon inclusus* Walker, *Cat. Brit. Mus. Neur.*, 2: 327.

1886. *Stiphroneura inclusus*, Gerstaecker, *Mitt. naturw. Ver. Neu. Vorpom. u. Rugen*, 16: 91.

1909. *Stiphroneura inclusa*, Needham, *Rec. Indian Mus.*, 3: 200.

*Additional characters*: Vertex: black and sparsely spotted dark brown; pronotum: with long black hairs on the antero-lateral corners; mesonotum: with mesoscutum and mesoscutellum bearing the similarly placed long whitish hairs; metanotum: prescutum and metascutellum laterally and metascutum postero-laterally with white hairs; forewing: with some of the costal veinlets at the base clouded brown; 14 crossveins before Rs which is with 13 branches and some of the crossveins being further subdivided by transverse veinlets; hindwing: with 11 crossveins before Rs which is with 13 branches; 2nd to 6th radial crossveins mutually connected by the transverse veinlets in the upper part; axillary plate present; legs: with bristles black and white and claws dark brown; abdomen: in male, with 7th segment clothed with long and black hairs and the ectoproct long with black bristles.

*Measurements*: ♂ : length of forewing, 69 mm; of hindwing, 70 mm; ♀ ♀ length of forewing, 73 mm; of hindwing, 74 mm.

*Material examined*: 1 ♂, 2 ♀ ♀ and 2 exs. (with missing abdomen): India: Sikkim; date and coll. nil.

*Distribution*: India: Himachal Pradesh and Sikkim; East Indies.

*Remarks*: The species hitherto restricted in the Indian and Malayan subregions of the Oriental region.

### \*Genus 8. *Talorus* Navas

1923. *Talorus* Navas, *Memorie Accad. pont., Nuovi Lincei*, (2) 6: 35.

Type-species: *T. oberthuri* Navas

*Distribution*: India: North Bengal.

*Remarks*: The genus was described by Navas (1923) from Kurseong, North Bengal. Amongst several characters mentioned by Navas (*loc. cit.*), the forked costal veinlets before the lemon-yellow pterostigma and psuedo-cubital branch in the forewing appear as salient features of this genus, of which, only one species is reviewed hereunder.

\*18. **Talorus oberthuri** Navas

1923. *Talorus oberthuri* Navas, *Memorie Accad. pont., Nuovi Lincei*, (2) 6: 35.

*Distribution*: India: North Bengal (Kurseong).

*Remarks*: From the illustrated account by Navas (1923), the species seems to be a valid one.

Tribe (d) ISOLEONINI

Holzel (1972) synonymised with this tribe Myrmecaelurini (Part), Gepini and Nesoleonini, all of which were earlier considered separately by Markl (1954). It is distributed throughout Africa, and Asia. Presently, only 3 Indian genera are known, of which only two are dealt with hereunder.

Key to the genera of the tribe ISOLEONINI

Wings rather elongate; forewing pointed or subfalcate at apex; wing membrane speckled or with streaks along gradates and not heavily marked or banded.....*Cueta* Navas

Wings short and broad; forewing rounded at apex; wing membrane heavily marked or banded with dark brown.....*Nesoleon* Banks

Genus 9. **Cueta** Navas

1911. *Cueta* Navas, *Insecta*, 1: 242.  
 1914. *Polancus* Navas, *Voyage Alluaud et Jeannel*, 24: 19.  
 1954. *Cueta*, Markl, *Verh. naturf. Ges.*, 65 (no. 2): 229.  
 1972 *Cueta*, Holzel, *Beitr. naturw. Forsch. Südwatl.*, 1: 27.

Type-species: *C. trilineata* Navas (= *Myrmeleon lineosus* Rambur)

*Characters*: Forewing: pointed or subacute at apex; membrane speckled or with streaks along the gradate series; not heavily marked or banded; hindwing: inner radial field with 6-12 cross-veins; legs: spur on hind tibia shorter than the 1st tarsal segment; abdomen: longer than the wing: ectoproct in male long and cylindrical.

*Distribution*: Albania, North Africa, Malagasy, Iran, Afghanistan, India and Sri Lanka.

*Remarks*: Amongst 7 Indian species recorded so far, the redescription of only one and description of two new ones are presently dealt with.

#### Key to the species of the genus **Cueta** Navas

1. Cu<sub>2</sub> in forewing without any spot at tip ;  
pronotum with numerous long white bristles.....*facile* Banks  
Cu<sub>2</sub> in forewing with an apical spot ;  
pronotum with sparsely oriented long white  
bristles.....2
2. Hind femur without long black hair ; dorsal  
abdominal spots attached with the median  
stripe by short peduncles ; base of all the  
forked veinlets beyond M with smoky brown  
patches.....*bolangirensis*, sp. nov.  
Hind femur with long black hairs ; dorsal  
abdominal spot separated from the median  
stripe ; base of all the forked veinlets beyond  
M without distinct smoky brown patches.....*angulensis*, sp. nov.

#### 19. **Cueta facile** Banks

1939. *Cueta facile* Banks, *Bull. Mus. comp. Zool. Harv.*, 85: 455-456.

*Redescription* (figs. 44-47): Head: pale yellowish; face and maxillary palpus: yellow; labial palpus: yellow except the brown terminal segment; vertex (fig. 44): with a median black stripe and two spots on each side, the anterior one rounded and extending obliquely to the base of the eye, posterior one also rounded

and connected with the median stripe by a short peduncle; inter-antennal mark forked; antenna: brown except the yellowish basal segment; pronotum: almost as long as broad, with numerous long and white bristles; a median black stripe together with a lateral pair of brown stripes, of which the inner one being anteriorly interrupted; meso-and metanotum: with 3 interrupted black stripes and white hairs on the convex area; meso-and metascutellum: with long, white hairs; pleura: with two longitudinal black stripes; wings: slender, hairy and with subacute tips: forewing: membrane with indistinct shade or markings; costal veinlets simple; pterostigma yellow; veins at apex and those at hind margin forked; 3 transverse veinlets beyond the pterostigma black; Sc and R with black bands; 10 crossveins before Rs which arises much beyond the cubital fork; Rs with black bands and 9 branches; banksian lines present; gradate-series on the upper and lower portions of anterior banksian line, junction of gradates with branches of Rs and the basal part of the forked veinlet on the hind margin black; M, Cu and 1A with black bands; crossveins forming the cells of cubital area above the posterior banksian line either completely black or with black bands; hind wing: smaller than the forewing: 10 crossveins before Rs which is with 9 branches: legs: yellow with white and black hairs and bristles; coxa in foreleg much enlarged and with a brown mark: femur with dark dots besides a large spot at apex; tibia with dots; spurs of fore-and mid tibiae and those of hind tibiae equal to the 2/3rd and almost half the length of the 1st tarsal segment respectively; abdomen: with dorsum bearing a median black stripe; the first four segments yellow and others pale brown; apex of male with two elongated appendages and long black bristles; tip in male and female and genitalia in male, as in figs. 45-47.

*Measurements:* ♂♂: length of body, 35-38 mm; of forewing, 24-26 mm; of hindwing, 35-38 mm; ♀♀: length of body, 26.5-30 mm; of forewing, 30-34 mm; of hind wing, 25-29 mm.

*Material examined:* 2 ♂♂: India: Orissa: Rajbani, Sundargarh town, 26.x.72, coll. J. M. Julka and party. 2 ♂♂, 2 ♀♀: Bihar: 1 km. S.E. of Chakulia Railway Station, Chhotanagpur, 26.x.68, coll. Raj Tilak and party. 1 ♂, Bihar: Field along Ganga river, Chas, Dhanbad, 22.xi.68, coll. Raj Tilak and party.

*Distribution*: India: Bihar, Orissa and Tamil Nadu.

*Remark*: The species is for the first time recorded from Orissa.

## 20. *Cueta bolangirensis*, sp. nov.

*Description* (figs. 48-49 & pl. I, fig. 4): Face: yellow; a black inter-antennal mark extending on either side as a narrow stripe; vertex: with two rows of black spots; pronotum (fig 48): with three dorsal black stripes extending upto the end of metanotum, the lateral ones interrupted; with long hairs on the lateral margin; pleura: with a black longitudinal stripe; wings (pl. I, fig. 4): hyaline and narrow; venation pale; forewing: with pale longitudinal veins bearing black patches; costa simple; veinlets beyond the pterostigma forked and connected with each other by transverse veinlets; pterostigma yellow, with a black mark before it; forked veinlets after pterostigma, base and apex of hypostigmatic cell and apical part clouded with brown; base of all the forked veinlets beyond M with smoky brown patches; two brown dots, one at the junction of  $Cu_1$  and M and the other at the junction of  $Cu_2$  and 1A; 9 crossveins before Rs bearing 6 branches; hindwing: shorter and narrower than the forewing; brown clouds on gradates not very prominent; 10 crossveins before Rs having 6 branches; legs: yellow; hind femur without long black hair; spur of hind tibia very short, about half as long as the 1st tarsal segment which is not longer than the 5th; abdomen: pale; a dorso-median black stripe extending from base to the apex; each segment with a rounded lateral black spot connected with the median stripe by a short peduncle; sternites black; tip in female, as in fig. 49.

*Measurements*: ♀ : length of body, 20.5 mm; of forewing, 23 mm; of hindwing, 21 mm.

*Material examined*: 1 ♀ (Holotype, Z.S.I. Reg. no. 1013/H<sub>12</sub>): India: Orissa: 4 km. south of the forest Rest House, Lathore, Harishankar, Bolangir, 22.v.72, coll. D. P. Sanyal.

*Distribution*: India: Orissa.

*Remarks*: The new species closely resembles *Cueta facile* Banks in having yellow pterostigma, three stripes on meso- and metanotum and transverse veinlets beyond the pterostigma, but it may be

distinguished from it by the forewing with a distinct spot at the junction of  $Cu_2$  and 1A, the number of crossveins before Rs including branches of the latter and also by the wing-length.

### 21. *Cueta angulensis*, sp. nov.

*Description* (figs. 41-43 & pl. II, fig. 5): Frons, clypeus and labrum: yellow; antenna: with dark brown mark in between antennae encircling their bases; dark brown with yellow basal segment; thorax: with scanty hairs; pronotum (Fig. 41): yellow, with a broad black median stripe and a very narrow stripe on either side, all being interrupted anteriorly; the former extending upto the end of abdomen; mesonotum: with several narrow black stripes on either side and with two black dots posteriorly; metanotum: with a narrow black stripe on each side; pleura: pale, with a longitudinal stripe and a number of black dots; forewing (pl. II, fig. 5): hyaline; apex almost rounded; Sc and R yellow: brownish patches along the longitudinal veins and their branches; presence of three smoky brown spots, the first at the junction of  $Cu_2$  and 1A, second at the apical portion of M and third at the end of hypostigmatic field; pterostigma: yellow, with a smoky brown patch at base; costa simple from the base to the stigma; veinlets on the pterostigma and those beyond also forked; 10 crossveins before Rs having 7 branches; hindwing (Pl. II, fig. 5): shorter and narrower than the forewing; no distinct spot; otherwise similar to forewing; legs: yellow; hind femur with long black hairs; apices of tibiae and each segment of the tarsus ringed brown; spur of hind tibia much shorter than the 1st tarsal segment; abdomen: yellow except the 7th and 8th black segments; black spots on the 3rd tergite anteriorly and near the middle of each segment from 4 to 8; tip and genitalia in male, as in figs. 42-43.

*Measurements*: 1 ♂: length of body, 26 mm; of forewing, 21.5 mm; of hindwing, 18.5 mm.

*Material examined*: 1 ♂ (Holotype, Z.S.I. Reg. no. 1044/H<sub>12</sub>): India: Orissa: Angul, 10.iv.73, coll. S. K. Gupta.

*Distribution*: India: Orissa.

*Remarks*: The species closely resembles *Cueta bolangirensis*,

sp. nov. by the presence of prothoracic and pleural stripes, spots at the junction of  $Cu_2$  and 1A and also on M, and absence of well differentiated spots on hindwing, but can be distinguished by the presence of meso- and metathoracic spots, spots at the tip of hypostigmatic field, number of crossveins before Rs, abdominal stripe and by the absence of smoky brown patches in the forked veinlets.

### Genus 10. **Nesoleon** Banks

1909. *Nesoleon* Banks, *J. N.York, ent. Soc.*, 17: 4.  
 1914. *Peringus* Navas, *Voyage Alluaud et Jeannel*, 24: 19.  
 1954. *Nesoleon*, Markl, *Verh. naturf. Ges. Basel*, 65 (no. 2): 229.  
 1969. *Nesoleon*, Holzel, *Ann. Naturhistor. Mus. Wien*, 73: 308.

Type-species: *Nesoleon braunsi* Banks

*Characters*: Antenna: Wide apart from its counterpart at base; wings: short, broad and rounded at apices; membrane with dark brown spots or bands; only one row of costal cells; anterior banksian line formed by branches of Rs reaching the apex of wing; forewing: with 6-10 crossveins before Rs; 2A and 3A after origin meeting at least at a point; hindwing: several crossveins before Rs; 1A connected directly with the hind margin by crossveins; legs: with the 1st tarsal segment of hind pair nearly as long as the apical one; spur of hind tibia shorter than the first tarsal segment; abdomen: with ectoproct in male long and cylindrical.

*Distribution*: North Africa, Taiwan and India.

*Remarks*: Only one species is so far reported from India, which is presently dealt with.

### 22. **Nesoleon perpunctatus** Banks

1931. *Nesoleon perpunctatus* Banks, *Psyche*, 38: 60.

*Additional characters* (figs. 50-52): Vertex: with two black spots on each side and connected with the median stripe by a narrow peduncle; forewing: with 11 crossveins before Rs which is with 12 branches; legs: with spur of hind tibia much shorter than the 1st tarsal segment; abdomen: tip in male and female and genitalia in male, as in figs. 50-52.

*Measurements:* ♂ ♂ : length of body, 39-43 mm; of forewing, 26-30.5 mm; of hindwing, 24-28 mm; ♀ ♀ : length of body, 26-32 mm; of forewing, 27-31.5 mm; of hindwing, 27-31.5 mm.

*Material examined:* 4 ♂ ♂, 3 ♀ ♀ : India: Bihar: 2 km. east of Chakulia Rly. Station, Chhotanagpur, 25-26.x.68, coll. Raj Tilak and party.

*Distribution:* India: Bihar and Andhra Pradesh.

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

#### Tribe (e) DENDROLEONINI

The tribe is reported to exhibit cosmopolitan distribution in the globe excepting for New Zealand. It is represented by 5 genera, of which only one is dealt with hereunder.

#### Genus 11. **Gatzara** Navas

1915. *Gatzara* Navas, *Mem. R. Acad. Cienc. Artes Barcelona*, 11: 375.  
1976. *Gatzara*, Stange, *Acta Zool. Lilloana*, 31: 298.

Type-species: *Gatzara jubilaea* Navas

*Characters:* 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 the 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 the 5th which is equal to the three preceding subequal ones taken together; hind femur without sensory hair; gonapophysis anteriores larger than the gonapophysis posteriores.

*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 Eastern India.

### 23. *Gatzara jubilaea* Navas

1915. *Gatzara jubilaea* Navas, *Mem. R. Acad. Cienc, Artes Barcelona*, 11 (no. 23), 386.

*Characters*: Vide Navas (1915).

*Measurements*: ♀ : length of body, 32 mm; of forewing, 37 mm; of hindwing, 36 mm.

*Material examined*: 1 ♀ : India: North Bengal, Darjeeling, Rajbari, 15.v.74, coll. N. Pradhan.

*Distribution*: India: North Bengal (Darjeeling).

*Remarks*: Navas (1915) gave a good account of the species coupled with illustration of the forewing. However, the measurements of the specimens, at hand, are noted above.

### \*Genus 12. *Layahima* Navas

1912. *Layahima* Navas, *Broteria*, 10: 36.

Type-species: *L. nebulosa* Navas

*Distribution*: India: North Bengal.

*Remarks*: The genus, which was referred to in the key by Banks (1941) on the basis of his study of myrmeleontid material repositied in the American Museum of Natural History, is represented by a single Indian species, as cited hereunder.

### \*24. *Layahima nebulosa* Navas

1912. *Layahima nebulosa* Navas, *Broteria*, 10: 36.

*Distribution*: North Bengal (Darjeeling).

*Remarks*: The species was described by Navas (1912) from India. A careful study of the publications of Navas (*loc. cit.*) and Banks (1941) leads the author to agree that Navas (*loc. cit.*) was justified to include the species *nebulosa* Navas under his genus *Layahima*.

## Tribe (f) ACANTHACLISINI

The tribe is known almost throughout the continental and insular areas of the globe. *Acanthaclisis* Rambur, *Syngenes* Kolbe and *Centroclisis* Navas, have so far been reported from India. Amongst 4 Indian species hitherto known under the genus *Acanthaclisis* Rambur, at least one species i.e., *eustalacta* (Gerstaecker) has, however, been transferred to *Centroclisis* Navas. On the basis of further study, the author, however, feels that three other species should also be relegated to the genus *Centroclisis* Navas. Thus, out of a couple of genera, only one is presently dealt with.

Genus 13. **Centroclisis** Navas

1909. *Centroclisis* Navas, *Butll. Inst. Catalana Hist. nat.*, 6: 71  
 1911. *Neboda* Navas, *Russk. ent. Obozr.*, 11: 114.  
 1912. *Sogra* Navas, *Broteria*, 10: 43.  
 1914. *Neoclis* Navas, *Ann. Mus. Civ.*, 46: 205.  
 1932. *Stenoclis* Navas, *Broteria Ci. nat.*, 1: 62.  
 1954. *Centroclisis*, Markl, *Verh. naturf. Ges. Basel*, 65 (no. 2): 231.  
 1972. *Centroclisis*, Holzel, *Beitr. naturk. Forsch. SüdwDtl.*, 1: 13.

Type-species: *Acanthaclisis cervina* Gerstaecker

*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 the pterostigma;  $Cu_2$  straight and reaching the hind margin; M somewhat curved apically and the 1st out of at least 4 branches of Rs forked near the 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 two species of the genus are redescribed from Eastern India.

Key to the species of the genus *Centroclisis* Navas

Pronotum longer than broad and more or less dark; forewing 13 mm in width and with a distinct black mark before pterostigma, at the apex of M and Cu and also Cu<sub>2</sub>.....*horridus* (Walker),  
comb. nov.

Pronotum broader than long and yellow, with a broad median longitudinal dark brown stripe; forewing 9 mm in width and without black mark as above.....*eustalacta* (Gerstaecker)

25. ***Centroclisis horridus*** (Walker), comb. nov.

1853. *Myrmeleon horridus* Walker, *Cat. Brit. Mus. Neur.*, 2: 336.  
 1868. *Acanthaclisis horridus*, MacLachlan, *J. Linn. Soc.*, 9: 276.  
 1909. *Acanthaclisis horridus*, Needham, *Rec. Indian Mus.*, 3: 200.  
 1911. *Acanthaclisis horridus*, Banks, *Proc. ent. Soc. Wash.*, 13: 101.  
 1921. *Acanthaclisis horridus*, Dover, *Rec. Indian Mus.*, 22: 396.

*Redescription* (figs. 53-54): Face: pale; antenna and epicranium: black; thorax (fig. 53): dorsum black with long white hairs laterally; pleura: pale yellowish with some black markings; forewing: costa simple; with the costal veinlets forked from the basal third onwards; pterostigma white with a black spot near the base; forked veins beyond the pterostigma connected by transverse veinlets; 10 crossveins before Rs, of which two are with smoky brown patches; Rs at origin and a few crossveins between R and Rs provided with smoky brown patches; Rs with 11 branches; a black mark each near the tip of M, Cu<sub>1</sub> and Cu<sub>2</sub>; some smoky brown patches near the tip of wing and on a few branches of Rs; hindwing: shorter and narrower than the forewing; 5 crossveins before Rs which is with 14 branches; brown dots present before and after the pterostigma; a brown mark near the tip of Cu<sub>1</sub> and M, besides a smoky brown shade from the tip of Cu<sub>1</sub> and M upto the hind margin; legs: with dense white hairs; femur yellow and with black bristles; tibia and tarsus yellow with dark brown patches; spur dark brown, curved and longer than the first tarsal segment; fifth segment almost equal to all the other segments taken together; abdomen: dorsum black, with white or grey hairs near the base; ventrally yellow; tip in female, as in fig. 54.

*Measurements*: ♀ ♀ : length of body, 30-37.5 mm; of forewing, 42-44 mm; of hind wing, 39.5-41 mm.

*Material examined*: 2 ♀ ♀ : India: Orissa: teak plantation, east of forest rest house, Sundargarh, 21.vi.72, coll. D. P. Sanyal.

*Distribution*: India: Bihar, Assam, West Bengal, Orissa and Tamil Nadu.

*Remarks*: The species has been justifiably included in the genus *Centroclisis* Navas by the presence of single row of costal cells.

## 26. *Centroclisis eustalacta* (Gerstaecker)

1863. *Acanthaclisis eustalacta* Gerstaecker, *Stettin. ent. Ztg.*, 24: 378.  
 1909. *Acanthaclisis eustalacta*, Needham, *Rec. Indian Mus.*, 3: 200.  
 1981. *Centroclisis eustalacta*, Ghosh, *Bull. zool. Surv. India*, 3(3): 269.

*Redescription*: Face: pale yellowish with dense white hairs except a few black ones antero-lateral to the clypeus; vertex: black, with two transverse rows of shiny spots; antenna: pale brown, with the distal margin of each segment dark; the basal segments bearing a circlet of long white hairs and the rest with short or long white hairs; thoracic segments: with long or short and white hairs; pronotum: much broader than long, with anterior margin narrower than the posterior, which is yellowish with five black stripes, the middle one being broader than others; mesonotum: each lobe and mesoscutellum with a broad median black stripe and a very narrow black stripe on either side; metanotum: mostly yellow, with a black stripe medially; metascutellum blackish; wings: long and hyaline, with apex acute; costal region almost straight upto the pterostigma; some of the crossveins forked and some of the areolets lying close to the grey pterostigma divided by transverse veinlets; veins pale and interrupted by dark brown spots; forewing: with 10 crossveins before Rs; branches of Cu divergent; presence of narrow linear brown stripe each at the end of M, Cu<sub>1</sub> and one of the branches of Rs; posterior banksian line formed by the branches of Cu<sub>1</sub>; apical and marginal veins forked; hindwing: narrower and shorter than the forewing; costal region dilated abruptly near the base; 6 crossveins before Rs which is with 11 branches; anterior and posterior banksian lines present; legs: dark brown and densely covered with white hairs; femora brown; tibia with short black hairs beneath

and some black bristles above; spur strongly bent at right angle; abdomen: black.

*Measurements*: ♂ : length of body, 35 mm; of forewing, 41 mm; of hindwing, 35 mm; ♀ : length of body, 33 mm; of forewing, 43 mm; of hindwing, 37 mm.

*Material examined*: 1 ♂ : India: Orissa: P.W.D. Compound, Konarak, 18.iii.73, coll. V K. Premkumar and party. 1 ♀ : Orissa: P.W.D. Inspection Bungalow, Titlagarh, 5.x.72, coll. S. Khera and party.

*Distribution*: India: Uttar Pradesh, Orissa and the Lakshadweep Island.

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

**\*27. *Centroclisis edax* (Walker), comb. nov.**

1853. *Myrmeleon edax* Walker, *Cat. Brit. Mus. Neur.*, 2: 317.

1921. *Acanthaclisis edax*, Dover, *Rec. Indian Mus.*, 22: 397.

*Distribution*: India: Orissa (Barkuda Island), Tamil Nadu (Madura Dist., Ramnad).

*Remarks*: Walker (1853) described *edax* under the genus *Myrmeleon* Linn. Dover (1921), while having worked on the neuropteroid insects from the Barkuda Island, transferred the species *edax* Walker under the genus *Acanthaclisis* Rambur without any reason for it. Holzel (1972), in course of his study on Myrmeleontidae from Asia, distinguished the genera *Centroclisis* Navas, *Syngenes* Kolbe and *Acanthaclisis* Rambur on the basis of the number of rows of costal cells in the forewing. There he pointed out that *Acanthaclisis* spp. should possess at least two rows of costal cells. The detailed examination of *edax* (Walker) made earlier by the author from different parts of India excepting for eastern India, has revealed the existence of only one row of costal cells. Following Holzel (1972), *edax* should than be considered under *Centroclisis* Navas.

**\*28. *Centroclisis indica* (Banks), comb. nov.**

1916. *Acanthaclisis indica* Banks, *Proc. ent. Soc. Wash.*, 13: 100.

*Distribution*: India: Bihar (Chapra).

*Remarks*: Banks (1911b) described the species from Bihar. The material were not, however, available for study. The author could examine the species from other parts of India. Banks (*loc. cit.*) statement, "Forewings with costal series mostly simple", has been corroborated with the author's findings and hence justify the transference of the species to the genus *Centroclisis* Navas.

### Tribe (g) DISTOLEONINI Banks

The tribe includes the members of its erstwhile counterparts including Formicaleonini, Nemoleonini, Creoleonini and Protoplectrini *Sensu* Markl (1954), all of which have been considered as synonyms of Distoleonini by Holzel (1972). It is reported to be distributed throughout the world. Presently, only 13 genera are known from India, of which only 4 are dealt with hereunder.

#### Key to the genera of the tribe DISTOLEONINI

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 as long as or longer than the two basal tarsal segments taken together.....3  
 Spurs hardly longer than the two basal tarsal segments taken together.....*Neuroleon* Navas
3. Spurs about as long as the two basal tarsal segments taken together.....*Macronemurus* Costa  
 Spurs always longer than the two basal tarsal segments taken together.....*Distoleon* Banks

#### Genus 14. *Creoleon* Tillyard

1860. *Creagris* Hagen, *Stettin. ent. Ztg.*, 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. SüdwDtl.*, 1: 60.

Type-species: *Myrmeleon lugdunense* Villers

*Characters*: Forewing: with the inner radial field having one vein; Cu with parallel forkings; two rows of cells present between forks of Cu and which are separated by a nearly straight vein; legs: with tarsus shorter than the tibia; 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 redescribed and another, reviewed from literature.

### 29. *Creoleon griseus* (Klug)

1834. *Myrmeleon griseus* Klug, *Symb. Phys.*, 4, tafel 36, fig. 8.  
 1853. *Myrmeleon perfidus* Walker, *Cat. Brit. Mus. Neur.*, 2: 350.  
 1853. *Myrmeleon sedulus* Walker, *Cat. Brit. Mus. Neur.*, 2: 355.  
 1853. *Myrmeleon adversus* Walker, *Cat. Brit. Mus. Neur.*, 2: 358.  
 1868. *Creagris perfidus*, MacLachlan, *J. Linn. Soc.*, 9: 277-278.  
 1909. *Myrmeleon adversus*, Needham, *Rec. Indian Mus.*, 3: 201.  
 1909. *Creagris sedulus*, Needham, *Rec. Indian Mus.*, 3: 202.  
 1972. *Creoleon griseus*, Holzel, *Beitr. naturk. Forsch. SüdwDtl.*, 1: 61.

*Redescription*: Face: pale, vertex: with a median brown stripe continuing up to the occiput; an anterior brown band and posterior broad and dark brown mark; antenna: basal segments yellow, with a dark brown band on the distal margin of each segment; pronotum: with 4 dark brown stripes, of which 2 are medially and the other two laterally placed, the latter not extending upto the anterior margin; meso- and metanotum: with the dorsum pitchy; pleura: interrupted with black stripe; wings: hyaline, with the subcostal areolets simple; no forked vein up to the pterostigma; forewing: with pterostigma yellow; 7 crossveins before Rs which is with 8 branches; Cu<sub>1</sub> parallel to Cu<sub>2</sub>; 1A parallel to Cu<sub>2</sub> before reaching the hind margin and connected with Cu<sub>2</sub> by brown crossveins; veins beyond the pterostigma, at the apex and at the hind margin—all forked; hindwing: narrower and shorter than the forewing; pterostigma indistinct and devoid of any crossvein; single crossvein before Rs, which is with 7 branches; Cu<sub>1</sub>, M, and Cu<sub>2</sub> parallel to each other; legs: pale

brown, with black and white hairs; a number of black dots on femur and tibia; spur of fore-and midtibiae equal to the 3 subequal tarsal segments, but spur of hind tibia equal to the 2 tarsal segments taken together; basal segment of tarsus shorter than the apical one; claws dark brown; abdomen: black.

*Measurements*: ♀ ♀ : length of body, 25-28.5 mm; of forewing, 30-32 mm; of hindwing, 30-32 mm.

*Material examined*: 1 ♀ : India: Orissa: Circuit house, Keonjhar, 23.ix.72, coll. K. Rai and party. 2 ♀ ♀ : Orissa: Amarda Road, Mayurbhanj, 22.iii.73, coll. same as above. 1 ♀ : Bihar: near Garga Dam, 16 kms. N.W. of Chas Bazar (Steel city), 18.xi.68, coll. Raj Tilak and party.

*Distribution*: Egypt, Sudan, Israel, Iran and India (Maharashtra, Tamil Nadu, Orissa, West Bengal, Bihar and 'North India').

*Remark*: The species is largely exotic in distribution.

### \*30. *Creoleon parallela* Banks

1911a. *Creagris parallela* Banks, *Proc. ent. Soc. Wash.*, 13: 101.

*Distribution*: India: Bihar (Pusa)

*Remarks*: The description, provided by Banks (1911a), justifies the inclusion of the species *parallela* in the genus *Creoleon*.

### \*Genus 15. *Allogama* Banks

1912. *Gama Navas*, *Broteria*, 10: 57.

1943. *Allogama* Banks, *Bol. ent. Venezolana*, 2: 166.

1954. *Allogama*, *Markl. Verh. naturf. Ges.*, 65 (no. 2): 242.

1977. *Allogama*, Ghosh & Sen, *Rec. zool. Surv. India*, 73: 302.

Type-species: *Gama irene* Banks

*Distribution*: India: West Bengal and Karnataka.

*Remarks*: The genus, formerly considered under the tribe Creoleonini by Markl (1954), has subsequently been transferred

to Distoleonini by Holzel (1972). The single Indian species in the genus is reviewed below.

**\*31. *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.

*Distribution*: India: West Bengal and Karnataka.

*Remarks*: Banks (1939) described the species under the genus *Gama* Navas which Markl (1954) found to be a homonym of *Gama* originally erected by Blanchard in 1850 for the relevant members of Coleoptera.

**Genus 16. *Neuroleon* Navas**

1909. *Neuroleon* Navas, *Act. Mem. Congr. Nat. Esp.*, 1: 148.  
1912. *Ganussa* Navas, *Insecta*, 2: 31.  
1912. *Nelees* Navas, *Broteria*, 10: 31.  
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. SüdwDtl.*, 1: 49.

Type-species: *Myrmeleon arenarius* Navas

*Characters*: Body usually small, with less spotted wing; forewing: with the costal field having one row of cells;  $Cu_1$  not parallel to  $Cu_2$ ; Cup well developed; hindwing: with the inner radial field having only one crossvein; legs: short and stout; spur short and in all the pair hardly longer than the 1st and 2nd tarsal segments taken together; abdomen: with the 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 has been described new to science and two known species from India have been established as new records from the region.

Key to the species of the genus **Neuroleon** Navas

1. Pronotum with no long white hairs laterally ; wing membranes without marking ; forewing over 30 mm in length ; hind femur without white bristles ; abdomen as long as the hindwing.....*guptai*, sp. nov.  
 Pronotum with 4-6 long white hairs laterally ; wing membranes with markings ; forewing less than 25 mm in length ; hind femur with 3 white bristles ; shorter than the hind wing.....2
2. Pterostigma with a distinct brown mark at the base and cubital field with a series of brown streaks on crossveins of the forewing.....*guernii* Navas  
 Pterostigma without any mark, as mentioned above and also cubital field without brown streak.....*apicalis* Navas

32. **Neuroleon guptai**, sp. nov.

*Description* (figs. 57-58 & pl. II, fig. 6): Labrum: brown; maxillary palpus: yellow, with the apical segment dark brown; clypeus: yellow; frons: yellow, with the dark brown basal portion and a narrow median line; antenna: dark brown, with yellow annulation at the tip of each segment; club reddish; eye: golden-yellow; vertex: black and much elevated posteriorly, and with two rows of reddish spots; pronotum (fig. 57): blackish, with a narrow pale yellow median stripe and prominent spots of irregular shape on either side of it; without long white hair laterally; meso- and metanotum: blackish, with inconspicuously narrow pale median line; forewing (pl. II, fig. 6): apex acute; with Sc and R yellow each having brown bands at the base of crossveins which are mostly whitish; crossveins in the costal region, a few in the radial field, on the disc and at the base of forked marginal veinlets in the apical part black; pterostigma indistinct, with its base and also that of forked marginal veinlets in the apical part of the wing bearing smoky patches; 7 crossveins before Rs which is with 8 branches; hindwing (pl. II, fig. 6): shorter and narrower than the forewing; all the crossveins mainly white except one black radial cross vein; 1 crossvein before Rs which is with 7 branches; legs: with black bristles and white hairs on the fore- and midpair; femur and tibia yellow; fore- and

midfemora and tibiae with dark brown patches and dots; hind femur and tibia with a few such dots, the former devoid of white bristles; spur of hind tibia as long as the 1st tarsal segment; all the tarsal segments yellow, except the tip of 5th segment, which is dark brown; claws brown, with a tooth at the base; abdomen: black and as long as the hind wing; with black pubescence and moderately long hairs on the last segment, which is yellow; tip in male, as in fig. 58.

*Measurements:* ♂♂ : length of body, 31 mm; of forewing, 26.5 mm; of hindwing, 24 mm; of abdomen, 24 mm.

*Material examined:* 1 ♂ : (Holotype, Z.S.I. Reg. no. 1045/H<sub>12</sub>): India: Orissa: On way to Taluka Angul, 12.iv.75, coll. S. K. Gupta. 1 ♂ (Paratype, Reg. no. 1046/H<sub>12</sub>): locality data: same as for the Holotype.

*Distribution:* India: Orissa.

*Remarks:* The species closely resembles *Neuroleon guernii* Navas in the colouration of antenna and abdomen, pattern of prothoracic marking, number of crossveins before Rs and that of its branches and presence of hairs and bristles on fore- and midlegs, but readily differs from it by the absence of lateral white hairs of pronotum, markings of wing membrane, white bristles of hind femur and also by the length of both wings and abdomen.

### 33. *Neuroleon guernii* Navas

1914. *Neuroleon guernii* Navas, *Russk. ent. Obozr.*, 14: 319.

*Redescription* (figs. 55-56): Face: pale; head: with a black mark above, below and in between the dark brown antennae; pronotum (fig. 55): black, with a pale and narrow median stripe and two anteriorly broad lateral stripes; lateral margin with long white hairs; meso- and metanotum: bordered yellow, otherwise black with some interrupted pale stripes; pleura: black; forewing: hyaline and subacute at apex; medio-cubital crossveins shaded brown distally; crossveins in the cubital field facing the hind margin, some branches of 1A and also forked veinlets both at the apex and hind margin shaded brown; an oblique brown spot extending from the end of Cu<sub>1</sub> to the 1st branch of Rs and a

brown spot at the base of white pterostigma; costa simple; all veins beyond the pterostigma forked; no connecting veinlet between crossveins; 7 crossveins before Rs which is with 8 branches; hindwing: shorter, narrower and more pointed at the apex than in the forewing; brown shade not prominent in the cubital field, except on the forked veinlets of hind margin; pterostigma indistinct; 1 crossvein before Rs which is with 8 branches; no anterior and posterior banksian line; legs: mainly pale brown; fore-and midfemora and tibiae with long white hairs and black bristles; 3 white bristles present in the hind femur; hind tarsus pale, with brown apical annulation on each segment; spur of hind tibia equal to the two basal tarsal segments taken together; 5th tarsal segment longest; abdomen: black: tip in female, as in fig. 56.

*Measurements:* ♂, ♀ ♀ : Orissa: length of body, 20-21 mm; of forewing, 21.5-22 mm; of hindwing, 20.5-22 mm.

*Material examined:* 1 ♂, 2 ♀ ♀ India: Orissa: Ghatgaon, Keonjhor, 31.iii.73, coll. S. K. Gupta and party.

*Distribution:* India: Rajasthan (Bikaner: Kolayat), Maharashtra (Bombay, Dadra) and Orissa; Sri Lanka.

*Remark:* The species constitutes a new locality record for Orissa.

#### 34. *Neuroleon apicalis* Navas

1915. *Neuroleon apicalis* Navas, *Mem. R. Acad. Cienc. Artes Barcelona*, 11(23): 11.

*Redescription* (figs. 59-60): Frons, clypeus, labrum and maxillary palpus: yellow; vertex: with two laterally transverse rows of dark brown spots coupled with only two median spots just behind these rows; antenna: brown and subclavate; pronotum (fig. 59): with 4-6 long bristles and 3 pair of black longitudinal stripes including the narrow median, the inconspicuous lateral and the marginal which extends to the anterior groove; meso-and metanotum: with two lateral stripes interrupted in several places together with two entire median longitudinal ones; wings: hyaline, with the subcostal areolets simple; veins extending upto the

pterostigma not forked; majority of veins on the apical and hind margin forked; forewing; with 7 crossveins before Rs which is with 10 branches; cubital fork divergent; the basal portion of the forked veinlets on the hind margin and gradates in the apical area with smoky brown patches; hindwing; 1 crossvein before Rs; legs: pale brown, and with black and white hairs; femora longer than tibiae in fore- and midpair, with brown dots and black bristles; tibiae dark brown at the base; spur of midtibia almost equal to the two tarsal segments taken together and, of hind tibia almost equal to the 1st tarsal segment; apical tarsal segment longer than the basal one; claws brown; abdomen: black; tip in female, as in fig. 60.

*Measurements*: ♀ ♀ : length of body, 20-22.5 mm; of forewing, 23.5-24 mm; of hindwing, 23-23.5 mm.

*Material examined*: 1 ♀ : India: Orissa: Circuit House, Keonjhar, 20.ix.72, coll. K. Rai and party. 1 ♀ : Orissa: Hill reserve forest, 31.iii.73, coll. S. K. Gupta and party. 1 ♀ : Orissa: Inspection bungalow, Angul, 2.v.72, coll. K. Rai and party.

*Distribution*: India: Pondicherry and Orissa.

*Remark*: The species is for the first time recorded from Orissa.

### Genus 17. *Macronemurus* Costa

1855. *Macronemurus* Costa, *Fauna Neapolitana Myrm.*, 2: 8.

1972. *Macronemurus*, Holzel, *Beitr. naturk. Forsch. SüdwDtl.*, 1: 44.

Type-species: *M. appendiculatus* Latreille

*Characters*: Antenna: close to its counterpart placed near the base; pronotum: narrower than the head; forewing: long: Cup shorter than a crossvein; hindwing: with the inner radial field having one crossvein; legs: spur of hindtibia about as long as the two basal tarsal segments taken together; abdomen: with ectoproct in male cylindrical and longer than the segment 8.

*Distribution*: Africa, India and Sri Lanka.

*Remarks*: Among the three Indian species, one is redescribed and one is reviewed from literature.

35. *Macronemurus nefandus* (Walker)

1853. *Myrmeleon nefandus* Walker, *Cat. Brit. Mus. Neur.*, 2: 357.  
 1868. *Macronemurus nefandus*, MacLachlan, *J. Linn. Soc.*, 9: 278.  
 1909. *Macronemurus nefandus*, Needham, *Rec. Indian Mus.*, 3: 201.

*Redescription* (figs. 61-62): Fronto-clypeal suture: with a black mark; frons: with a median brown stripe; vertex: brown, with the hinder part having some ferrugineous dots and lines; antenna: yellowish, clavate and a little shorter than the thorax; distal margin of each joint brown; pronotum (fig. 61): narrower in front, with two ferrugineous spots and a stripe on either side; meso-and metanotum: yellowish, with ferrugineous spots on each disc; pleura: pale, with some ferrugineous markings; wings: hyaline and pointed; with pterostigma whitish and indistinct; veins with black and white bands; costal veins mostly not forked before the pterostigma; gradates towards the apex and veinlets along the hind margin clouded pale brown; fore wing: with 7 crossveins before Rs, which is with 9 branches; branches of Cu diverging; posterior banksian line present; hindwing: longer and narrower than the forewing and lanceolate at apex; only 1 crossvein before Rs, which is with 10 branches; legs: pale, with black and white hairs; brown dots on femur and tibia; base and apex of tibia bordered brown; spur of hind tibia approximately equal to the 1st tarsal segment which is nearly equal to the 5th one; abdomen: tip in female as in fig. 62.

*Measurements*: ♀♀ : length of body, 22-26 mm; of forewing; 26-29 mm; of hindwing, 28-30 mm; ♂ : length of body, 28 mm; of forewing, 26 mm; of hindwing, 28 mm.

*Material examined*: 3 ♀♀ : India: Orissa: near Bus stand, Sundargarh, 24.x.72, coll. J. M. Julka. 1 ♀ : Orissa: Cuttack, 2 kms. east of Nandan Kanan, 23.iii.74, coll. S. K. Ghosh. 3 ♀♀ : Orissa: Bolangir, 11.xi.72, coll. J. M. Julka. 1 ♀, 1 ♂ : Orissa, Rajbari, Sundargarh, 26.x.72, coll. J. M. Julka. 2 ♀♀ : Orissa: Old circuit house, Sundargarh, 25.x.72, coll. J. M. Julka. 4 ♀♀ : Orissa: P.W.D. Inspection Bungalow, Titlagarh, 5.x.72, coll. S. Khera. 1 ♀ : Bihar: Chhotanagpur: Chakulia Bungalow, Singhbhum, 27.x.72, coll. Raj. Tilak.

*Distribution*: "North India", Bihar and Orissa.

*Remarks:* The species constitutes new locality record from Bihar and Orissa.

**\*36. *Macronemurus trivittatus* Banks**

1911. *Macronemurus trivittatus* Banks, *Proc. ent. Soc. Wash.*, 13: 101.

*Distribution:* INDIA: Bihar.

*Remarks:* Banks (1911 a) correctly described the species under the genus *Macronemurus* Costa. The characters observed by Banks (*loc. cit.*) for differentiating the species from its allies appear convincing.

**Genus 18. *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. SüdwDtl.*, 1: 55.

Type-species: *Distoleon verticalis* Banks

*Characters:* Antenna: shorter than the 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<sub>2</sub> not parallel neither to Cu nor to the hind margin; legs: densely hairy; hindtibia and femur in male generally with long and dark hairs; tarsus much shorter than the tibia; tibial spur longer than the 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 a couple was already considered under *Distoleon* Banks and the remainder, under the genus *Formicaleon* Banks. Presently, three of them are reviewed from literature, one newly combined

and two more described new to science. The species under review have not been brought in the key.

Key to the species of the genus **Distoleon** Banks

1. Pterostigma rosy; pronotum with 4 irregular pitchy stripes; forewing 10 mm in width; apex of both wings acute.....*verendus* (Walker),  
comb. nov.

Pterostigma yellowish, with a brown mark at base; pronotum with 3 very narrow and yellow lines; forewing not more than 6 mm in width; apex of both wings subacute or blunt.....2

2. Veins or crossveins in the milky-white spaces of wings yellow; M, Cu<sub>1</sub> and Cu<sub>2</sub> of forewing with a distinct brown streak at apex; hindwing with a lance-shaped brown mark at the apex of Cu<sub>1</sub> and M; 2nd abdominal segment without long white hair...*sambalpurensis*, sp. nov.

Veins or crossveins unicolorous throughout and no milky-white space in wings; only Cu<sub>2</sub> of forewing with an indistinct brown streak at apex; hindwing without brown mark as above; 2nd abdominal segment with long white hairs.....*bisoiensis*, sp. nov.

37 **Distoleon verendus** (Walker), comb. nov.

1853. *Myrmeleon verendus* Walker, *Cat. Brit. Mus. Neur.*, 2: 342.  
1853. *Myrmeleon minax* Walker, *Cat. Brit. Mus. Neur.*, 2: 343.  
1868. *Formicaleon verendus*, MacLachlan, *J. Linn. Soc.*, 9: 277.  
1909. *Formicaleo verendus*, Needham, *Rec. Indian Mus.*, 3: 200.  
1977. *Formicaleon verendus*, Ghosh & Sen, *Rec. zool. Surv. India*, 73: 306.

*Additional characters* (figs. 10-11): Face: yellow; pronotum: a rounded pale brown spot on anterior transverse groove and on either side of the median stripe; forewing: 8 crossveins before Rs which is with 12 branches; hindwing: with 1 crossvein before Rs; legs: with spur much curved and as long as basal four tarsal segments taken together; basal segment of tarsus shorter than the apical one.

*Sexual dimorphism*: Female (fig. 11): with much stout body

and longer wings; hindwing with an oblong brown spot formed by the clouded gradates on the distal 3/4 portion near the hind margin. Male (fig. 10): with less stout body and shorter wings; hindwing without oblong brown spot.

*Measurements*: ♂♂ : length of body, 32-35 mm; of forewing, 32-36 mm; of hindwing, 32-36 mm. ♀♀ : length of body, 30-31 mm; of forewing, 35-37 mm; of hindwing, 35-37 mm.

*Material examined*: 2 ♀♀, 3 ♂♂ : India: Orissa: Jharpara, Angul, 30.ix.72, coll. K. Rai. 2 ♂♂ : Orissa: Puranagarh, Angul, 29.ix.72, coll. K. Rai. 1 ♀ : Orissa: P.W.D. Inspection Bungalow, Jharsugoda, 17.ix.72, coll. K. Rai. 1 ♂ : Orissa: Puranakota, Angul, 2.x.72, coll. K. Rai. 2 ♂♂, 1 ♀ : Orissa: Karatpeta, Angul, 29.ix.72, coll. K. Rai. 1 ♂ : Orissa: Nisa, 1.x.72, coll. K. Rai.

*Distribution*: INDIA: Himachal Pradesh, "North India" and Orissa.

*Remarks*: As apparent from the synonymy list, this species, was originally described under *Myrmeleon* Linn. and, subsequently transferred by MacLachlan (1868) to *Formicaleo* Leach which was considered by Banks (1911b) as a synonymy of *Formicaleon* Banks. Holzel (1972) is of the opinion that *Formicaleon* Banks is a synonym of *Distoleon* Banks. Hence *Myrmeleon verendus* is considered by the author as *Distoleon verendus* (Walker).

### 38. *Distoleon sambalpurensis*, sp. nov.

*Description* (figs. 65-66 & pl. II fig. 8): Face: yellow; with a black band just above the antennal socket extending on either side up to the eyes; antenna: black with yellow rings; vertex: with two rows of black spots; pronotum (fig. 65): slightly narrowed in front, black and with black and white hairs; a pale yellow median line and a narrow lateral one on either side; meso- and metanotum and pleura: black; wings (pl. II, fig. 8): acute at tip; some translucent milky-white spaces on disc and apex with yellow crossveins; forewing: Sc, Cu and the anals brown with pale yellow bands; pterostigma yellow with a dark spot at base; crossveins and forked veinlets mostly marked with brown clouds; base and apex of hypostigmatic cell and crossveins

beyond with smoky brown patches; a brown mark at the apical portion of M and Cu<sub>1</sub>; a large spot at the junction of Cu<sub>2</sub> and 1A, extending obliquely up to the middle of cubital area; 9 crossveins before Rs, which is with 11 branches; hindwing: shorter and narrower than the forewing; a smoky brown spot at the tip of M and Cu<sub>1</sub>, extending obliquely up to the 1st and 2nd branches of Rs; 1 crossvein before Rs, which is with 11 branches ending on the hind margin; legs: with densely dark spots; first femur mostly dark; tip of tarsal joints dark; spur brown, curved and equal to the 4 basal tarsal joints taken together; long and short and black and white hairs: abdomen: dark, with the 6th and 8th segments yellow anteriorly; dorsal hairs mostly black, those on the sides white; tip in female as in fig. 66.

*Measurements:* ♀ ♀ : length of the body, 31 mm; of forewing, 35 mm; of hindwing, 33 mm.

*Material examined:* 2 ♀ ♀ (Holotype, Z.S.I. Reg. no. 1047/H<sub>12</sub> and Paratype, Z.S.I. Reg. no. 1048/H<sub>12</sub>): India: Orissa: Sambalpur forest Rest house, 29.ix.72, coll. S. Khera and party.

*Distribution:* INDIA: Orissa.

*Remarks:* The species can easily be distinguished from all others of *Distoleon* Banks by the markings of the wings.

### 39. *Distoleon bisoiensis*, sp. nov.

*Description* (figs. 63-64 & pl. II, fig. 7): Clypeus: yellow; frons: with a dark brown mark; antenna: dark brown, with yellow rings; vertex: anteriorly black and posteriorly brownish-yellow; pronotum (fig. 63): broader than long, with a longitudinal, narrow and yellow median stripe and two short and narrow ones on either side extending up to the anterior suture; mesonotum: with yellow marks on the disc; metanotum: blackish, with scutellum yellow; forewing (pl. II, fig. 7): hyaline, with apex acute; Sc and R yellow; majority of the veins and crossveins either wholly or partly dark brown; pterostigma yellowish, with a brown mark at base; some smoky brown patches at the beginning of hypostigmatic cell, on a few crossveins, and also between the apices of forked veinlets at the hind margin towards apex; an indistinct

brown mark at the end of  $Cu_2$ ; 7 crossveins before Rs which is with 8 branches; hindwing (pl. II, fig. 7): smaller and narrower than the forewing; veins mainly pale, but Sc and R with brown bands; pterostigmal region and the basal part of hypostigmatic cell with brown marks; pale brown shades in between apices of forked veinlets at the hind margin towards apex; 1 crossvein before Rs; legs: with femur dark brown and tibia yellow; spur of hind tibia as long as the first two tarsal segments taken together; fore-and midfemora and tibiae with long and densely white hairs and black bristles; white hairs slightly present on hind femur and tibia; abdomen: dark brown; with tergites 3-4 and 6-8 having yellow marks dorsolaterally; tip in female is in fig. 64.

*Measurements*: ♀ : length of body, 26 mm; of forewing, 28.5 mm; of hindwing, 25.5 mm.

*Material examined*: 1 ♀ (Holotype, Z.S.I. Reg. no. 1049/H<sub>12</sub>): India: Orissa: Bisoi, Mayurbhanj, 23.iv.73, coll. S. K. Gupta and party.

*Distribution*: INDIA: Orissa.

*Remarks*: The species resembles with *Distoleon rhodocerus* Navas by the presence of prothoracic stripes, marking at the junction between  $Cu_2$  and 1A and brown marks on a few crossveins and forked veinlets at the hind margin of forewing but, it may be distinguished by the marks on the vertex, colour of pterostigma with the brown mark directed basad, number of crossveins before Rs and of branches of the latter and also by the colour of abdomen.

#### \*40. *Distoleon pallipenne* Banks

1930. *Distoleon pallipenne* Banks, *Bull. Mus. comp. Zool. Harv.*, 85(7): 463.

*Distribution*: INDIA: Bihar (Chapra).

*Remarks*: Banks (1939) described the species from Chapra, now in Bihar and not erstwhile "Bengal", as mentioned by him (*loc. cit.*). However, the presence of greyish area at middle of

pronotum, broad pterostigma of forewing and nearly hyaline hindwing, as mentioned by Banks (*loc. cit.*), at once distinguishes the species from its allies.

**\*41. *Distoleon brahmanicus* (Banks), comb. nov.**

1913. *Formicaleon brahmanicus* Banks, *Proc. ent. Soc. Wash.*, 15: 142.  
1977. *Formicaleon brahmanicus*, Ghosh, *Newsl. zool. Surv. India*, 3 (no. 1): 37.

*Distribution*: INDIA: Himachal Pradesh and Bihar.

*Remarks*: Banks (1913b) described the species from Bihar under his genus *Formicaleon*. Subsequently, Holzel (1972) synonymised the genus with *Distoleon* Banks. The description of *brahmanicus*, as provided by Banks (*loc. cit.*) suggests that the species should belong to *Distoleon* Banks—a view which the author holds, too, on his further studies of the material from Himachal Pradesh in closer details.

**\*42. *Distoleon cerdo* (Gerstaecker)**

1893. *Formicaleo cerdo*, Gerstaecker, *Mitt. naturh. ver. Neu. Vorpomm. u. Rugen*, p. 127.  
1977. *Formicaleon cerdo*, Ghosh & Sen, *Rec. zool. Surv. India*, 73: 305.

*Distribution*: INDIA: West Bengal.

*Remarks*: Gerstaecker (1893) described and Ghosh & Sen (1977) catalogued the species from West Bengal under the genus *Formicaleo* Leach and *Formicaleon* Banks respectively, both of which Holzel (1972) synonymised with *Distoleon* Banks. The author is quite agreeable to retain the species under the genus in question.

**\*Tribe (h) GLENURINI**

The tribe exhibits a rather cosmopolitan distribution in the world and includes two genera from the region under consideration.

**\*Genus 19. *Negrokus* Navas**

- 1930b. *Negrokus* Navas, *Memorie Accad. pont., Nuovi Lincei*, (2) 14: 420.

Type-species: *N. lebasi* Navas

*Remarks:* The genus was described by Navas (1930b) from Kurseong, West Bengal. Banks (1940) has, however, opined to include it in the tribe Glenurini, though he (*loc. cit.*) stated, "it is said to lack spurs" The single species from India is reviewed hereunder.

**\*43. *Negrokus lebasi* Navas**

1930b. *Negrokus lebasi*, Navas, *Memorie Accad. pont., Nuovi Lincei*, (2) 14: 321.

*Distribution:* INDIA: North Bengal (Kurseong) and possibly Sikkim.

*Remarks:* The description and schematic diagrams of the wings, as given by Navas (1930b) provide ample scope to consider *N. lebasi* Navas as a good species.

**\*Genus 20. *Indophanes* Banks**

1940. *Indophanes*, Banks, *Proc. U.S. natn. Mus.*, 88: 195.

Type-species: *Myrmeleon barbarus* Walker

*Distribution:* INDIA: Western, northern and eastern peninsular belts.

*Remarks:* Banks (1940) characterised the genus mainly by the venation of forewing. The single species known from India is dealt with hereunder.

**\*44. *Indophanes infestus* (Walker)**

1853. *Myrmeleon infestus*, Walker, *Cat. Brit. Mus. Neur.*, 2: 357.

1940. *Indophanes infestus*, Banks, *Proc. U.S. natn. Mus.*, 88: 195.

*Distribution:* INDIA: Maharashtra, "North India" and Bihar.

*Remarks:* Walker (1853) described the species from North India, and pointed out the presence of an oval spot on the forewing, while MacLachlan (1868) transferred *Myrmeleon infestus* Walker to the genus *Glenurus* Hagen without any reason. Later, Banks (1940) transferred *infestus* to his genus. So, it may

be presumed that Banks had access to Walker's material, although he did not mention it categorically. In the absence of any diagram of the wings in the publications, as cited above, the inclusion of *infestus* in *Indophanes* Banks is accepted for the time-being.

\*Tribe (i) MYRMECAELURINI

The tribe is known throughout Africa and also from Southern Europe and Western Asia. Out of a couple of Indian genera, only one is so far recorded from the region under consideration.

\*Genus 21. *Myrmecaelurus* Costa

1855. *Myrmecaelurus*, Costa, *Fauna Napol.*, *Myrm.*, p. 10.

Type-species: *M. trigrammus* Pallas

*Distribution*: Europe, Africa, Western and South-Eastern Asia.

*Remarks*: Out of three Indian species originally known under the genus, one, i.e. *implexus* Walker, has earlier been transferred to *Nohoveus* Navas by Ghosh (1981), while another is presently reviewed from literature.

\*45. *Myrmecaelurus acerbus* (Walker)

1853. *Myrmeleon acerbus*, Walker, *Cat. Brit. Mus. Neur.*, 2: 336.

1868. *Myrmecaelurus acerbus*, MacLachlan, *J. Linn. Soc.*, 9: 278.

*Distribution*: Iran; Baluchistan; India: Rajasthan (Nagaur: Gudha, Sambhar lake; Bikaner; Kalayat; Jaisalmer; Nokh); Uttar Pradesh (Mussoorie); Punjab (Chevist); Bihar (Palamou and Pusa).

*Remarks*: Walker (1853) described the species from "North India" MacLachlan (1868) revised Walker's (1853) catalogue and transferred the species to the genus *Myrmecaelurus* Costa. Subsequently, it was reported by Needham (1909) from Bihar, Punjab and Uttar Pradesh as *Myrmecaelurus acerbus* (Walker). From the description of the species particularly by Walker (1853) as well as the earlier examination of the same from Rajasthan by the author it appears that MacLachlan (1868) and other subsequent workers were justified in retaining the species under *Myrmecaelurus* Costa.

## SUMMARY

The paper incorporates the taxonomic account along with earlier investigation, external morphology, terminology and geographical distribution of the family Myrmeleontidae under the suborder Planipennia of the order Neuroptera from Eastern India. Out of a total of twenty seven species examined, five from Orissa and two from Assam have been described new to science, twelve including one indetermined element have been redescribed and eight, established as new locality records for the area under consideration. The distribution of the said fauna is quite interesting, since four species are hitherto known to be exotic, while the remaining twenty four are endemic in India. Running keys to all the taxa examined, their morphovariations, relevant illustrations, references and the literature review of eighteen other species including five new combinations have been provided. Thus, an account of forty-five species distributed over twenty one genera and nine tribes under three subfamilies of Myrmeleontidae from Eastern India has been furnished in the paper.

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## REFERENCES

- ADAMS, A., 1956. New ant-lions from the south-western United States (Neuroptera: Myrmeleontidae). *Psyche*, 63 (no. 3): 82-108.
- BANKS, N., 1899. A classification of the North American Myrmeleontidae. *Can. Ent.*, 31: 67-71.
- BANKS, N., 1911(a). Notes on Indian Neuropteroid insects. *Proc. ent. Soc. Wash.*, 13: 146-160.
- BANKS, N., 1911(b). Notes on African Myrmeleontidae. *Ann. ent. Soc. Am.*, 4: 1-31.
- BANKS, N., 1913(a). Synopsis and descriptions of exotic Neuroptera. *Trans. Am. ent. Soc.*, 39: 201-242.
- BANKS, N., 1913(b). New exotic neuropteroid insects. *Proc. ent. Soc. Wash.*, 15: 137-143.
- BANKS, N., 1913(c). The neuropterous genus *Palpares*. *Ann. ent. Soc. Am.*, 6: 171-191.
- BANKS, N., 1914. Zoological results of the Abor Expedition 1911-1912. xxvi. Neuropteroid insects. *Rec. Indian Mus.*, 8: 351-356.
- BANKS, N., 1927. Revision of the nearctic Myrmeleontidae. *Bull. Mus. comp. Zool. Harv.*, 68: 1-84.
- BANKS, N., 1931. Some oriental neuropteroid insects. *Psyche*, 38: 56-70.
- BANKS, N., 1939. New genera and species of Neuropteroid insects. *Bull. Mus. comp. Zool. Harv.*, 85: 440-504.
- BANKS, N., 1940. Report on certain groups of Neuropteroid insects from Szechwan, China. *Proc. U.S. natn. Mus.*, 88: 173-220.
- BANKS, N., 1941. Some new and interesting neuroptera in the American Museum of Natural History. *Am. Mus. Novit.*, no. 1143: 5 pp.
- DOVER, C., 1921. Neuropteroid insects of Barkuda Island. *Rec. Indian Mus.*, 22: 397.
- ESBEN-PETERSEN, P., 1913. Mecoptera and Planipennia collected in Java by Edward Jacobson. *Notes Leyden Mus.*, 35: 225-236.
- GERSTAECKER, A., 1893. Uber neue and weniger bekannte Neuroptera aus der Familie Megaloptera Burm. *Mitt. naturw. Ver. Neu-Vorpomm. U. Rugen*, 25: 93-173.
- GHOSH, S. K., 1977(a). Fauna of Rajasthan, India—Neuroptera. *Rec. zool. Surv. India*, 72: 309-313.
- GHOSH, S. K., 1977(b). On a collection of Neuroptera from Himachal Pradesh. *Newsl. zool. Surv. India*, 3(1): 36-38.
- GHOSH, S. K. & SEN, S., 1977. Check-list of Indian Planipennia (Order Neuroptera). *Rec. zool. Surv. India*, 73: 277-326.
- GHOSH, S. K., 1980(a). On a small collection of Neuroptera from Andaman and Nicobar Islands. *Rec. zool. Surv. India*, 77: 247-254.

- GHOSH, S. K., 1980(b). New record of the species *Indophanes barbarus* (Walker) (Myrmeleontidae: Neuroptera) from India. *Bull. zool. Surv. India*, 3(1 & 2): 119.
- GHOSH, S. K., 1981. On new and little known species of Planipennia (Order Neuroptera) from India. *Bull. zool. Surv. India*, 4(2): 131-139, 1 pl., 4 figs.
- HOLZEL, H., 1972. Die Neuropteren Vorderasiens. IV. Myrmeleontidae. *Beitr. naturk. Forsch. Südwdtl.*, 1: 3-103.
- LINNAEUS, C. V., 1767. *Systema naturae*, Ed. xii., 1(2): 533--1327. Laur. Salvii, Holmiae.
- MACLACHLAN, R., 1868. New genera and species of neuropterous insects; and a revision of Mr. F. Walker's British Museum catalogue of Neuroptera, Part 2 (1853), as far as the end of the genus *Myrmeleon.*, *J. Linn. Soc.*, 9: 230-281.
- MARKL, W., 1954. Vergleichend-morphologische studien Zur Systematik und Klassifikation der Myrmeleoniden (Insecta, Neuroptera). *Verh. naturf. Ges. Basel*, 65(2): 178-263.
- NAVAS, L., 1912(a). Notas sobre Myrméléonides (Ins. Neuroptera). *Broteria (Zool.)*, 10: 29-75, 85-97.
- NAVAS, L., 1912(b). Myrméléonides nouveaux de L'extreme orient (Neuroptera). *Russk. ent. Obozr.*, 12: 110-114.
- NAVAS, L., 1914. Myrméléonides nouveaux ou critiques. *Ann. Soc. Sci., Bruxelles*, 38: 229-254.
- NAVAS, L., 1915. Neuropteros nuevos O poco conocidos (Cuarta Series). *Mems. R. Acad. Cienc. Barcelona*, 11(23): 1-28.
- NAVAS, L., 1923. Insecta orientalia. I. Series. *Memorie Accad. pont., Nuovi Lincei*, (2)6: 29-41.
- NAVAS, L., 1924. Insecta orientalia. II & III Series. *Memorie Accad. Pont., Nuovi Lincei*, (2)7: 211-228.
- NAVAS, L., 1929(a). Comunicacions entomologicus. Insectos de la India. *Revta. Acad. Cienc. exact fis.-quim. nat., Zaragoza*, 12: 177-197.
- NAVAS, L., 1929(b). Insecta orientalia. *Memorie Accad. pont., Nuovi Lincei*, (2)12: 29-48.
- NAVAS, L., 1930(a). Insectos de la India. *Revta. Acad. Cienc. exact fis.-quim. nat. Zaragoza*, 13: 29-48.
- NAVAS, L., 1930(b). Insecta orientalia. VIII. Series. *Memorie Accad. pont., Nuovi Lincei*, (2)14: 419-434.
- NAVAS, L., 1931(a). Insectos de la India. *Revta. Acad. Cienc. exact fis.-quim. nat. Zaragoza*, 14: 74-92.
- NAVAS, L., 1932. Insecta orientalia. *Memorie Accad. pont., Nuovi Lincei*, (2)16: 913-956.

- NAVAS, L., 1933. *Insecta orientalia. Memorie Accad. pont., Nuovi Lincei*, (3)1: 217-228.
- NEEDHAM, J. G., 1909. Notes on the Neuroptera in the collection of the Indian Museum. *Rec. Indian Mus.*, 3: 185-210.
- RAMBUR, M. P., 1842. *Histoire naturelle des Insectes. Neuropteres*. Roret, Paris, 534 pp.
- STANGE, L. A., 1970. A generic revision and catalog of the Western hemisphere glenurini with the description of a new genus and species from Brazil (Neuroptera: Myrmeleontidae). *Los Angeles County Museum, Contributions in Science*, no. 186: 1-28.
- TILLYARD, R. J., 1926. *The insects of Australia and Newzealand*. Angus and Robertson, Sydney; 560 pp.
- TJEDER, B., 1970. In *Tuxens, Taxonomists Glossary of genitalia*, 17. Neuroptera: 89-99.
- WALKER, F., 1853. Sialides-Nemopterides. Catalogue of the specimens of Neuropterous insects in the collection of the British Museum. 2: 193-476. By order of the Trustees, London.
- WALKER, F., 1858. Characters of undescribed Neuroptera in the collection of W. W. Saunders, Esq., F.R.S. etc. *Trans. R. ent. Soc. Lond.*, 2(5): 176-199.
- WESTWOOD, J. O., 1848. *The cabinet of oriental Entomology*. Smith, London, 88 pp.



TABLE SHOWING BIO-GEOGRAPHY OF NEUROPTERA : MYRMELEONTIDAE FROM EASTERN INDIA AND THE RELATED GLOBAL AREAS

Number of species/ sub-species corresponding to their enumerated names as given in the Systematic Account	P A L A E A R C T I C	E T H I O P I A N	O R I E N T A L																		
			I n d i a n																		
			H i m a l a y a n										P e n i n s u l a r								
			Chinese	North-Eastern										Northern	Western	Southern	Eastern			Insular	Malayan
				North Western	North Bengal	Sikkim	Assam	Meghalaya	Manipur	Arunachal Pradesh	Bihar	West Bengal	Orissa								
I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII				
1																	N				
2													+								
3				+								+	+		+	+					
4										+					+	+					
5						+				+	+	+			+	+					
6										+			+	+	+						
7												+					N				
× 8								+													
†† 9							+														
* 10					+																
11				+									+				N				
†† 12							+														
* 13					+								+								
* 14																					
* 15																+					
* 16															+	+					
17				+		+											+				
* 18					+																
19													+	+			N				
†† 20																	+				
†† 21																	+				
22													+	N							

	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII	XVIII
23					+													
* 24					+													
† 25							+						+	+	+	+		
26											+						N	+
* † 27													+			+		
* † 28														+				
29	+	+		?							+	+	+	+	+	+		
* 30														+				
* 31													+		+			
†† 32																+		
33												+					N	+
34													+				N	
35											+				N		N	
* 36														+				
† 37				+							+							+
†† 38																		+
†† 39																		+
* 40														+				
* † 41				+										+				
* 42															+			
* 43					+	?												
* 44											+	+		+				
* 45	+			+							+	+		+				
TOTAL	2	1	—	6+?	6	2+?	3	1	—	—	9	7	9	14+2N	9	14+8N	3	1
SPP.																		
SUBSP.																		

*N.B.*: ††, described new to science; \*, reviewed from literature; +, known distribution; N, new locality records; ?, doubtful locality; †, combination novum; X, species indetermined, but with detailed description.

## ALPHABETICAL INDEX

(Italicised names indicate taxal synonyms)

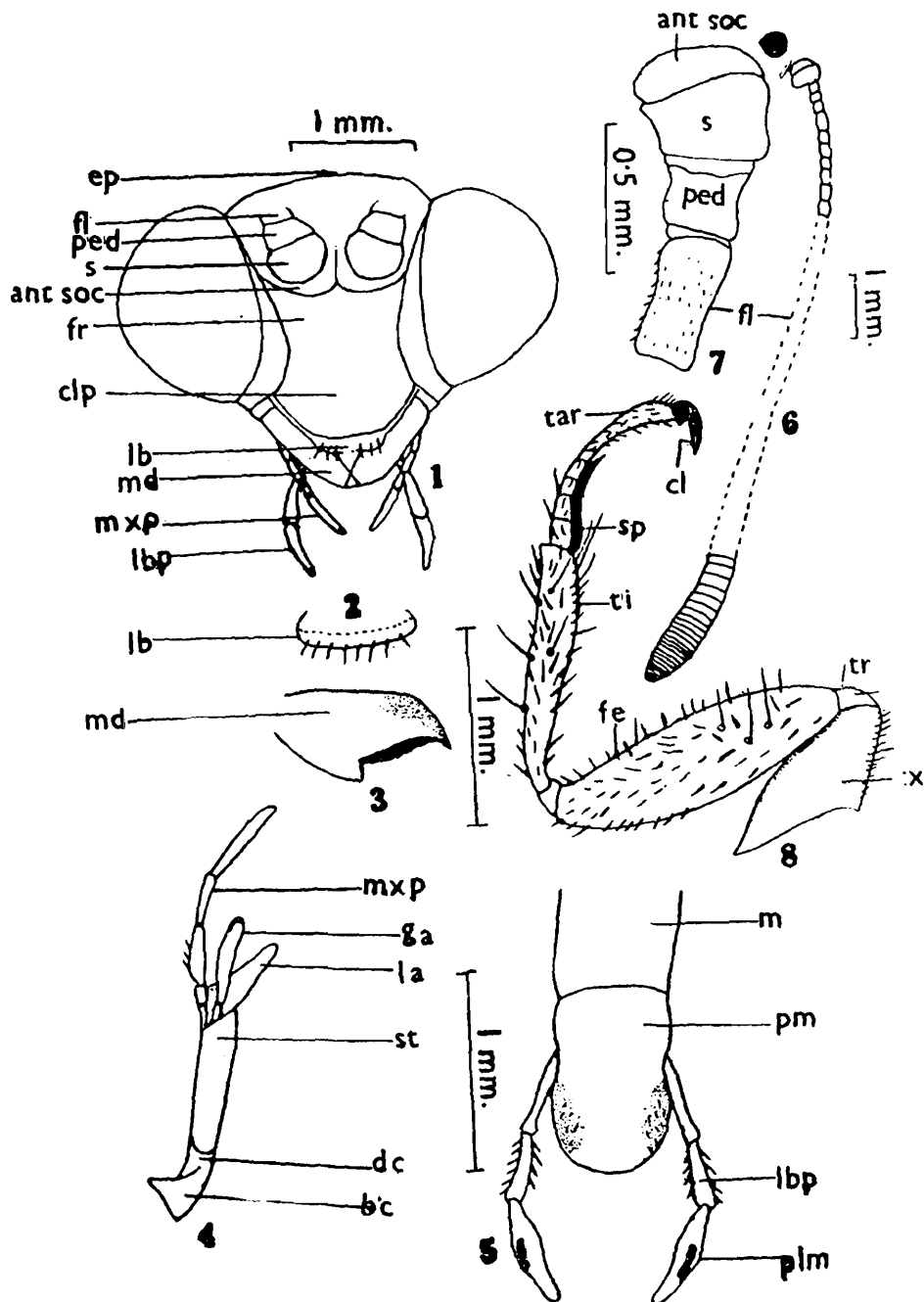
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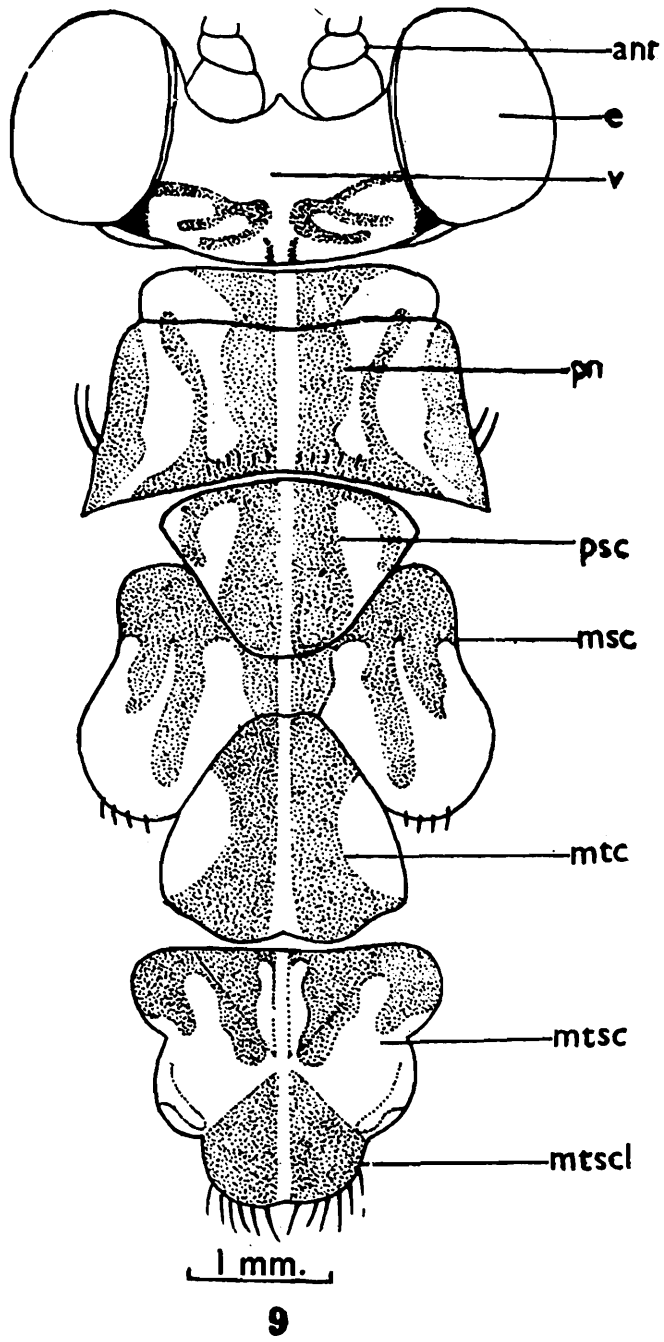
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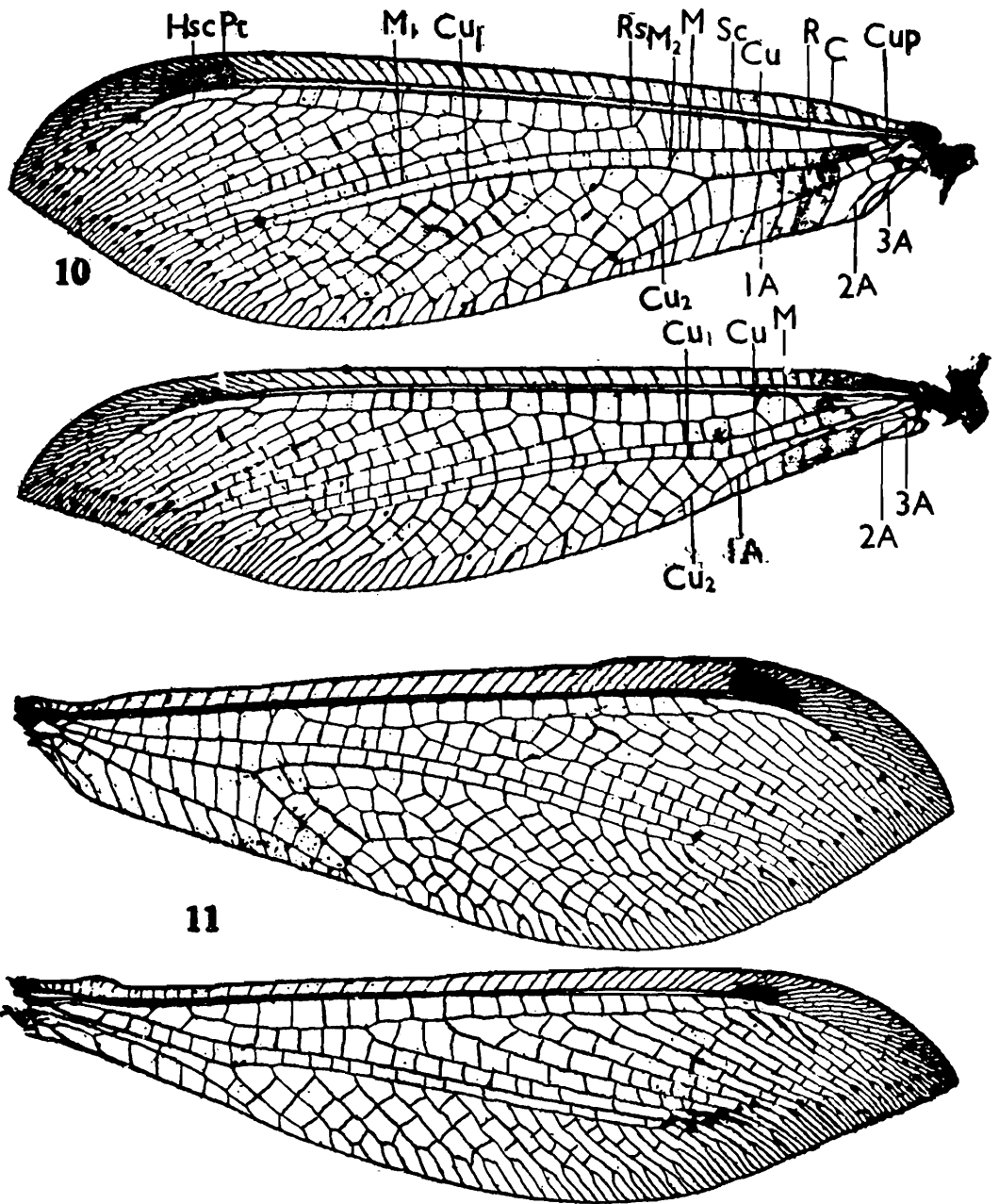
## **FIGURES**



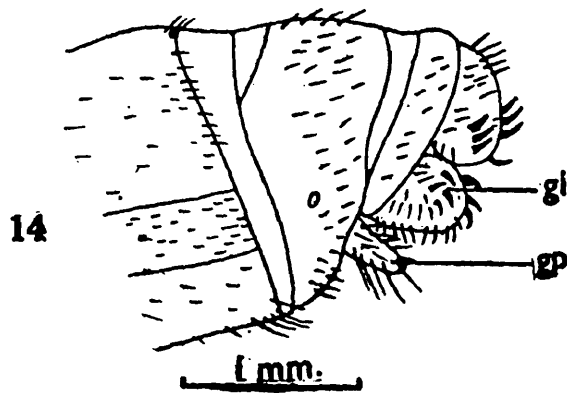
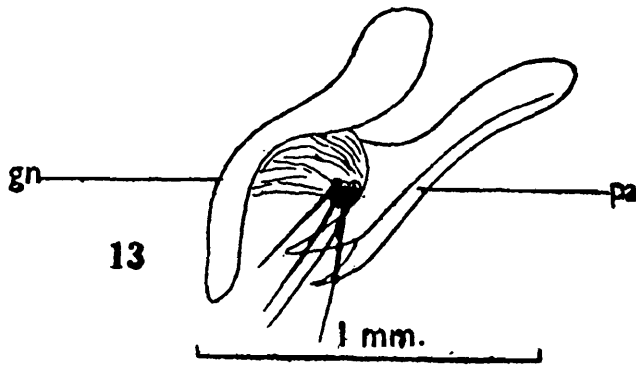
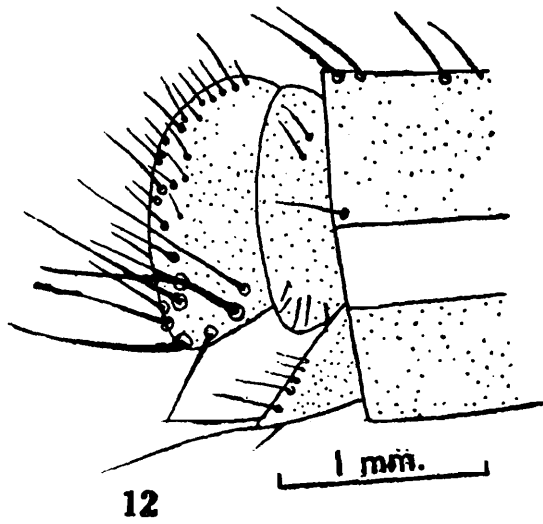
Text figs. 1-8. *Distoleon verendus* (Walker): 1. head [Frontal]; 2. labrum; 3. mandible; 4. maxilla; 5. labium; 6. antenna; 7. parts of antenna, magnified; 8. foreleg.



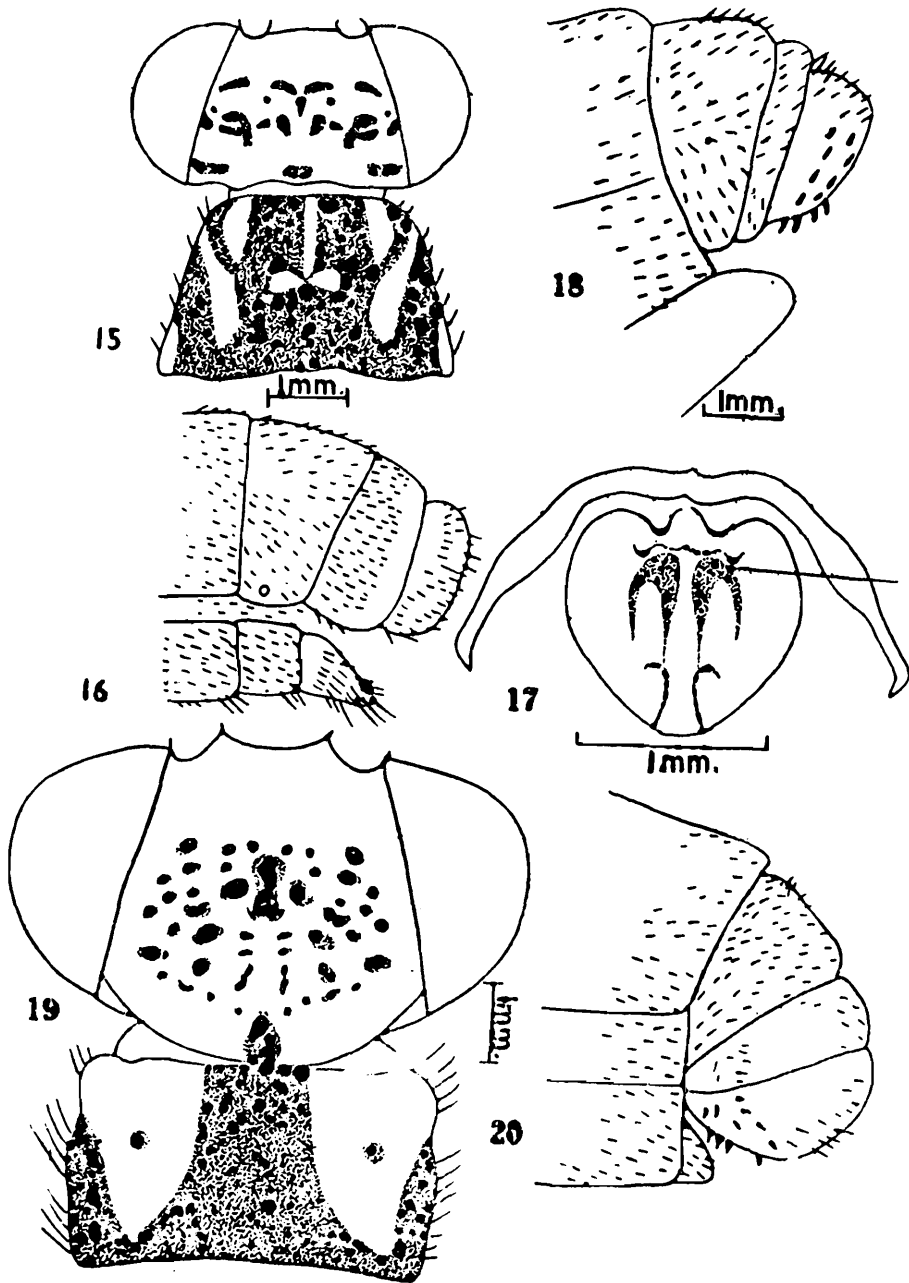
Text fig. 9. *Distoleon verendus* (Walker): head and thorax, dorsal.



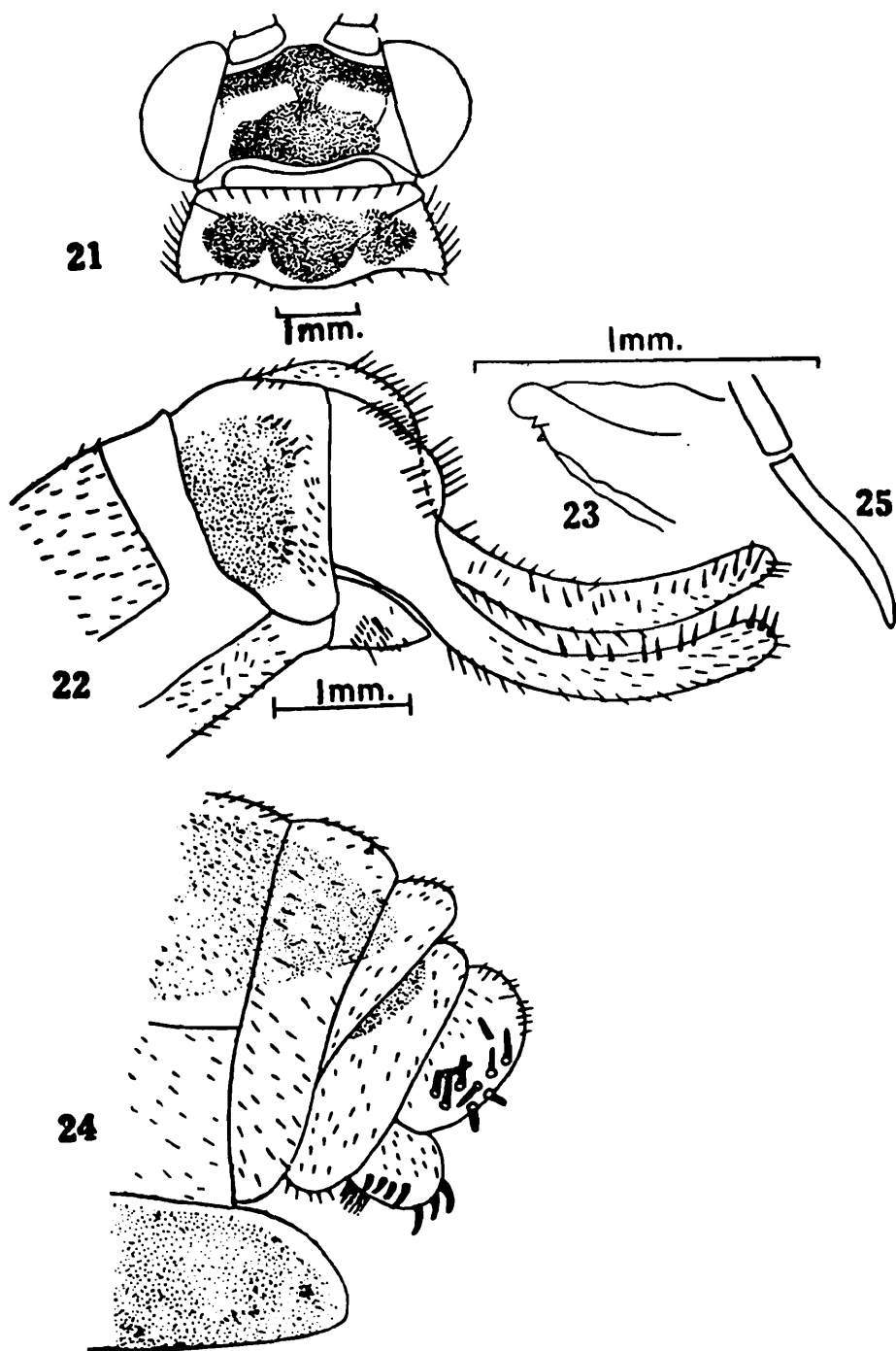
Text figs. 10-11. *Distoleon verendus* (Walker): male: 10. Fore-and hindwing; female: 11. fore-and hindwing.



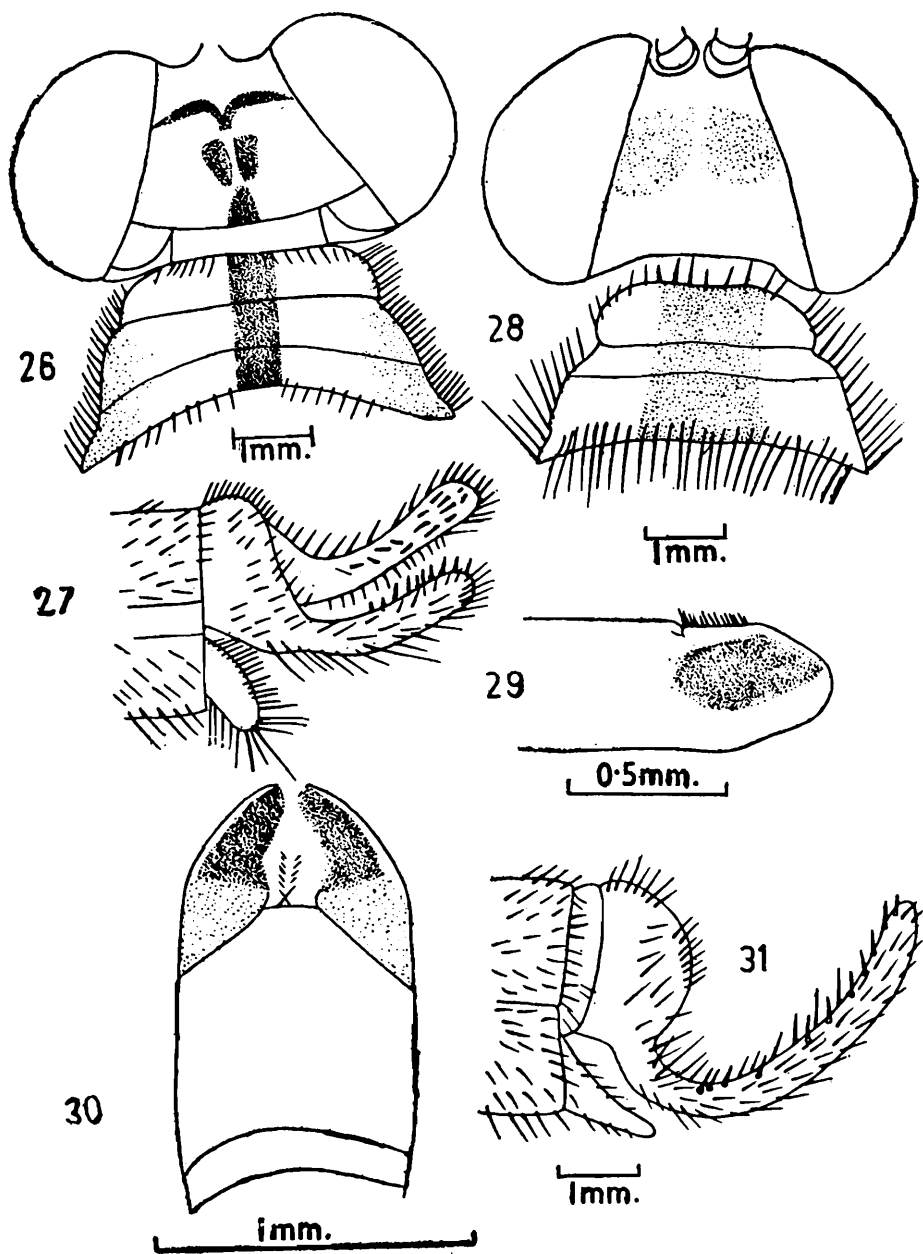
Text figs. 12-14. *Distoleon verendus* (Walker): male: 12. tip of abdomen, dorsal; 13. genitalia, lateral; female: 14. tip of abdomen, lateral.



Text figs. 15-20. *Echthromyrmex orientalis* MacLachlan: male: 15. head and prothorax, dorsal; 16. tip of abdomen, lateral; 17. genitalia, lateral; 18. *Palpares pardus* (Rambur): female: tip of abdomen, lateral; 19. *Stenares hyaena clara* Navas: female: head and prothorax, dorsal; 20. tip of abdomen, lateral.

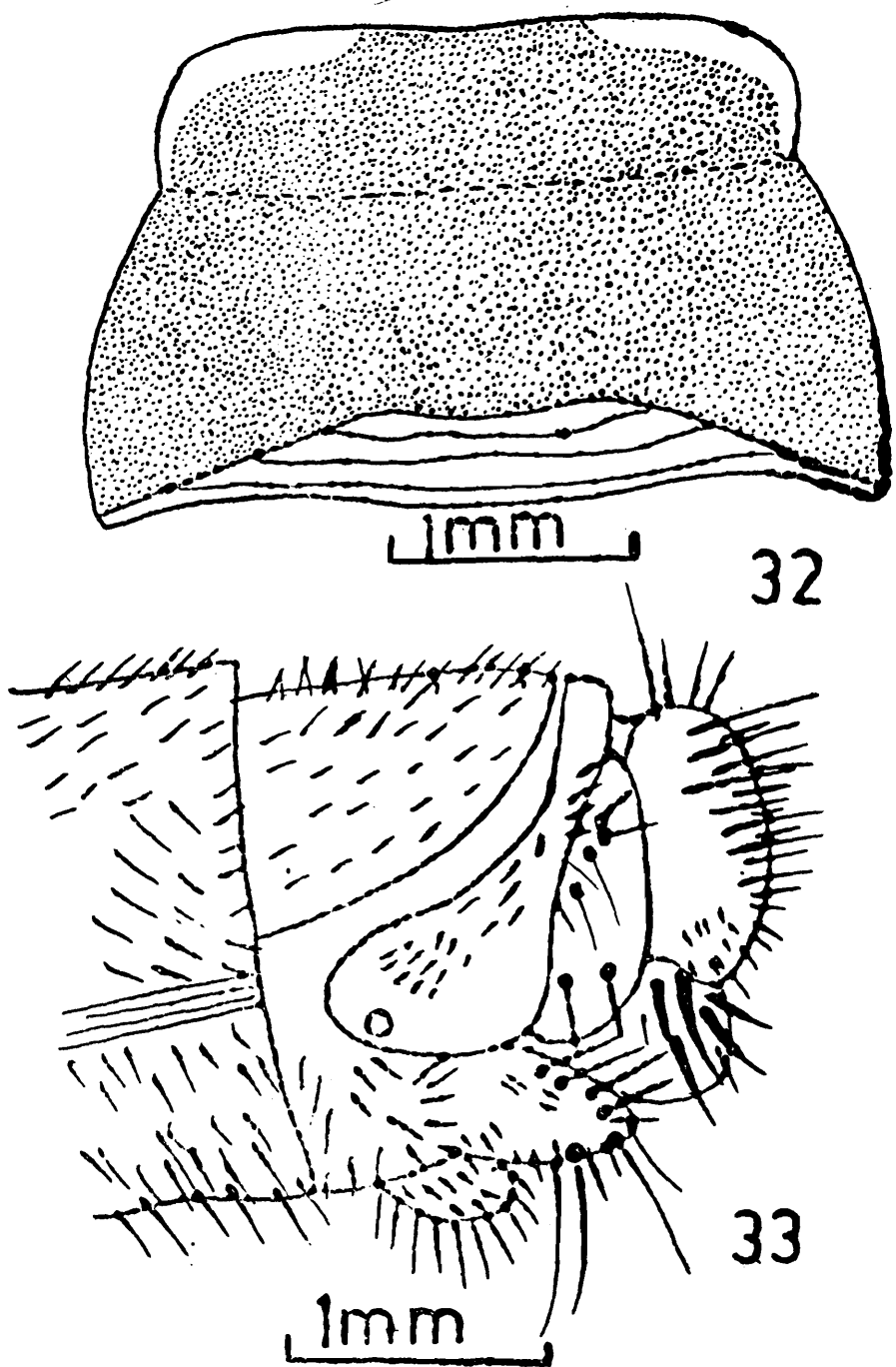


Text figs. 21-25. *Tomatares pardalis* Fabricius: male: 21. head and prothorax, dorsal; 22. tip of abdomen, lateral; 23. genitalia, lateral; female: 24. tip of abdomen, lateral; 25. spermatheca lateral.

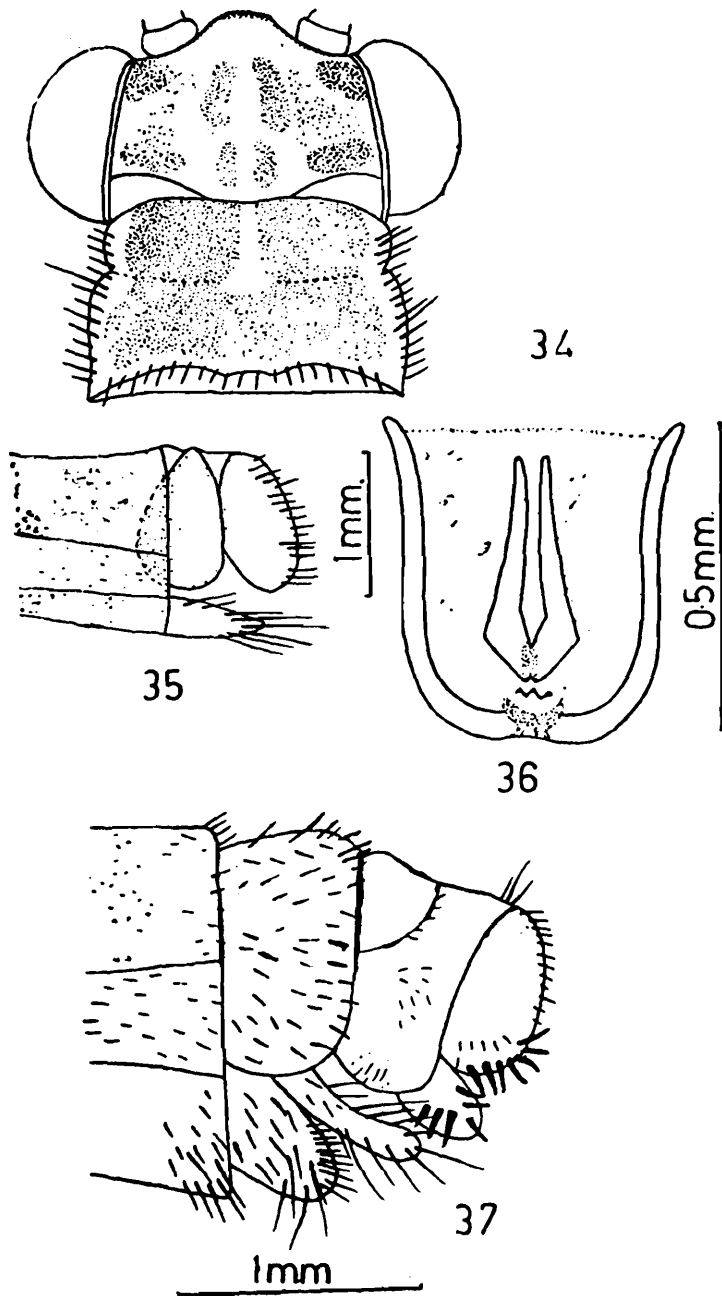


Text figs. 26-27. *Palpares contrarius* (Walker): male: 26. head and prothorax, dorsal; 27. tip of abdomen, lateral.

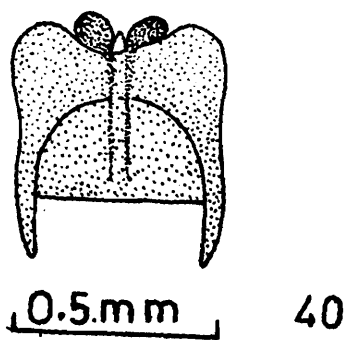
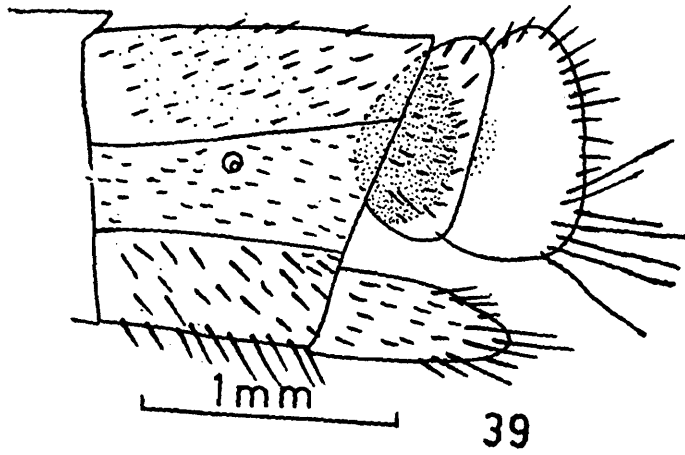
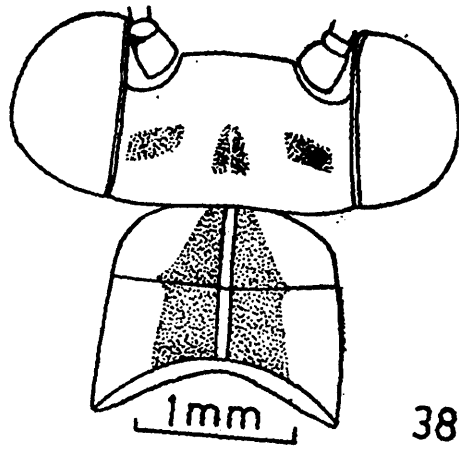
Text figs. 28-31. *Palpares pardus* (Rambur): male: 28. head and prothorax, dorsal; 29. genitalia, lateral; 30. genitalia, caudal; 31. tip of abdomen, lateral.



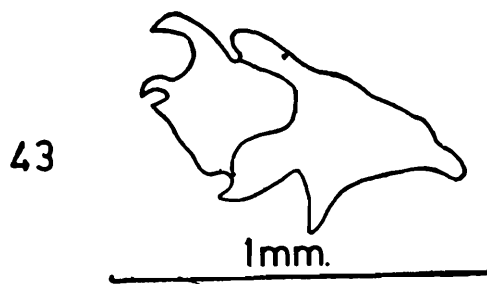
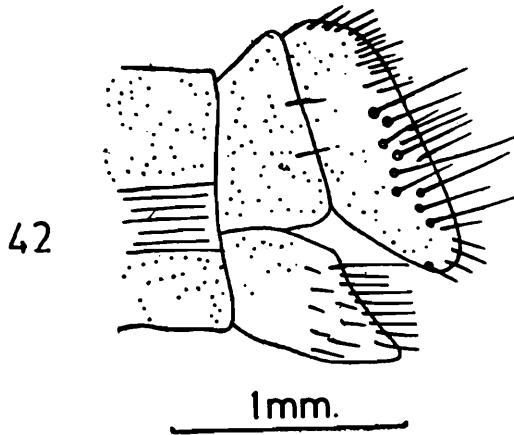
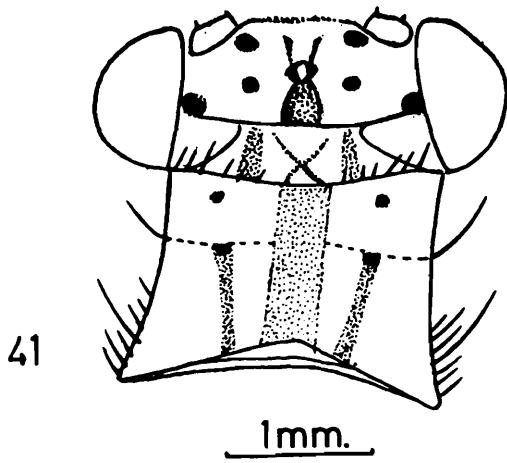
Text figs. 32-33. *Hagenomyia* sp.: female: 32. prothorax, dorsal; 33. tip of abdomen, lateral.



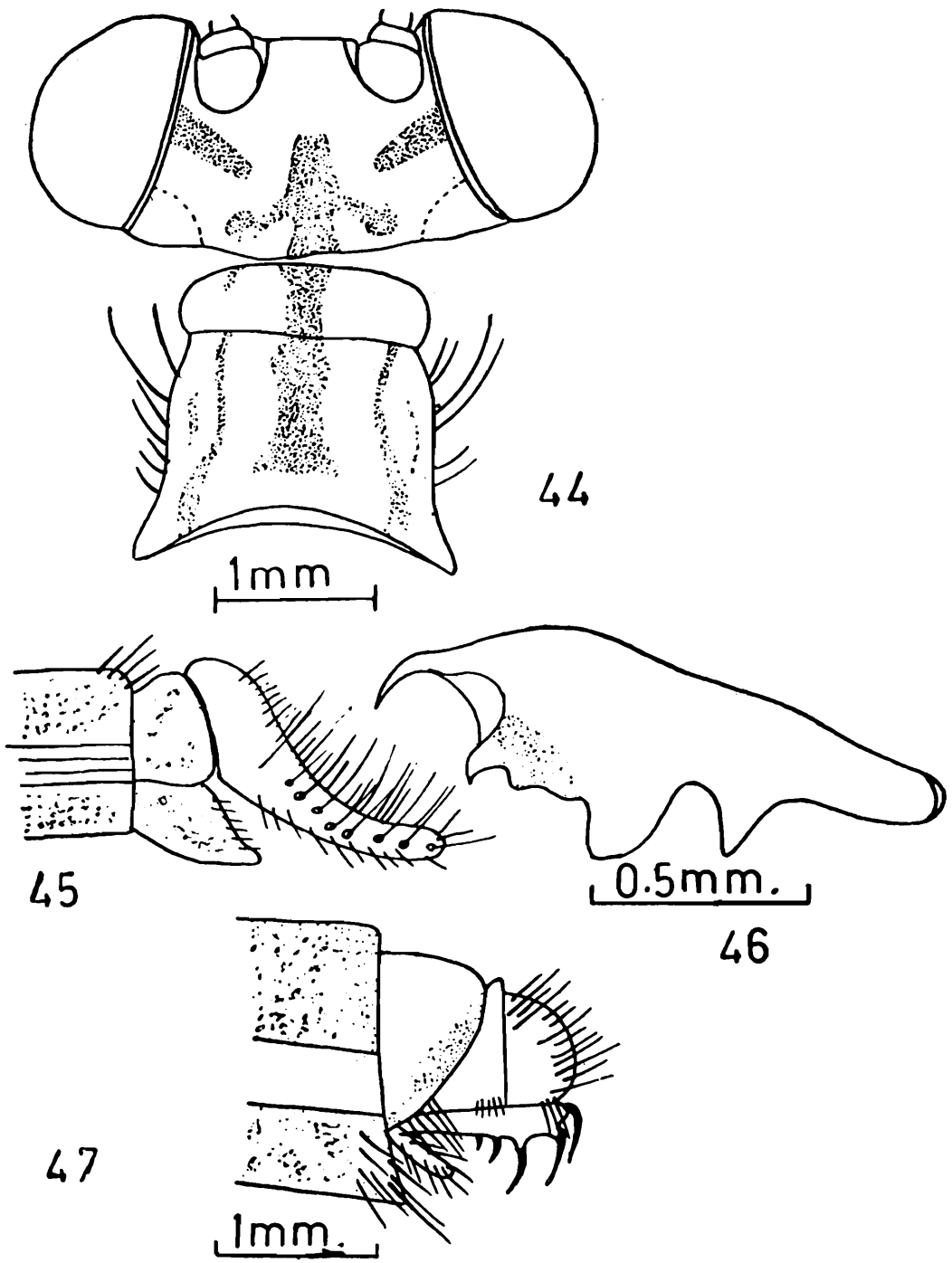
Text figs. 34-37. *Hagenomyia jamduarensis*, sp. nov., male: 34. head and prothorax, dorsal; 35. tip of abdomen, lateral; 36. genitalia, ventral; female: 37. tip of abdomen, lateral.



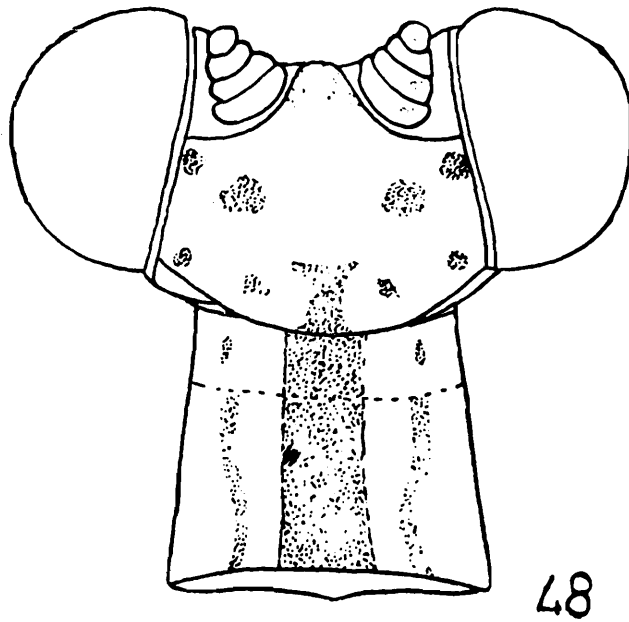
Text figs. 38-40. *Myrmeleon assamensis*, sp. nov., male: 38. head and prothorax, dorsal; 39. tip of abdomen, lateral; 40. genitalia, dorsal.



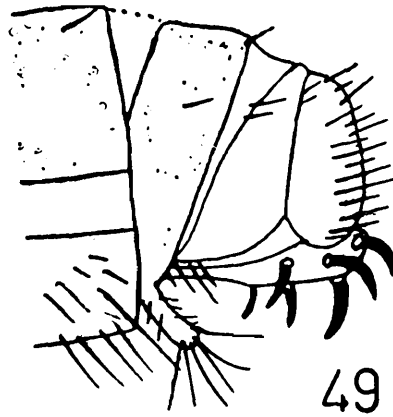
Text figs. 41-43. *Cueta angulensis*, sp. nov., male: 41. head and prothorax, dorsal; 42. tip of abdomen, lateral; 43. genitalia, lateral.



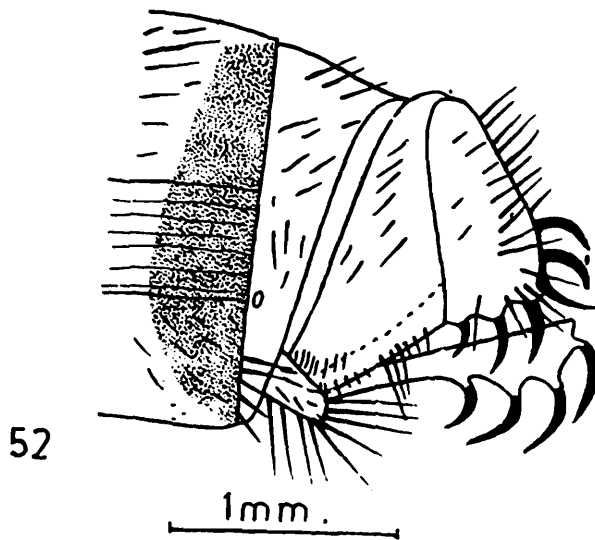
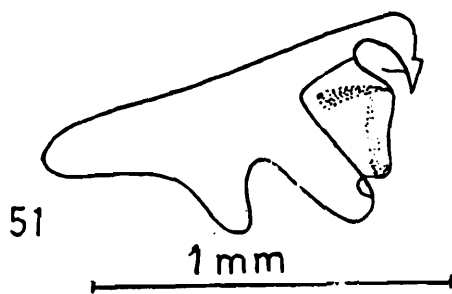
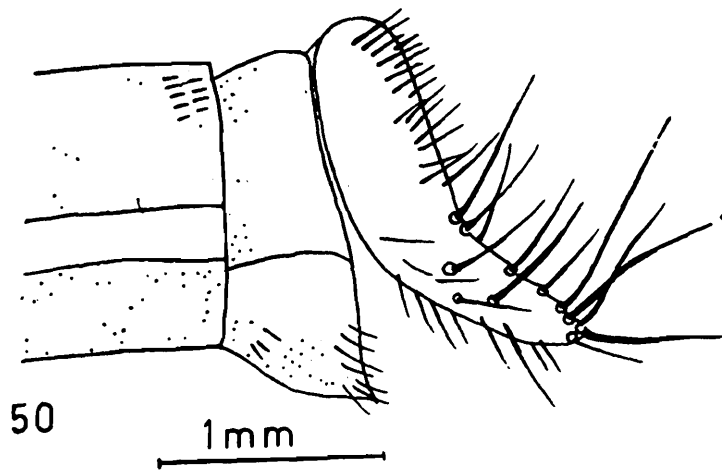
Text figs. 44-47. *Cueta facile* Banks: male: 44. head and prothorax, dorsal; 45. tip of abdomen, lateral; 46. genitalia, lateral; female: 47. tip of abdomen, lateral.



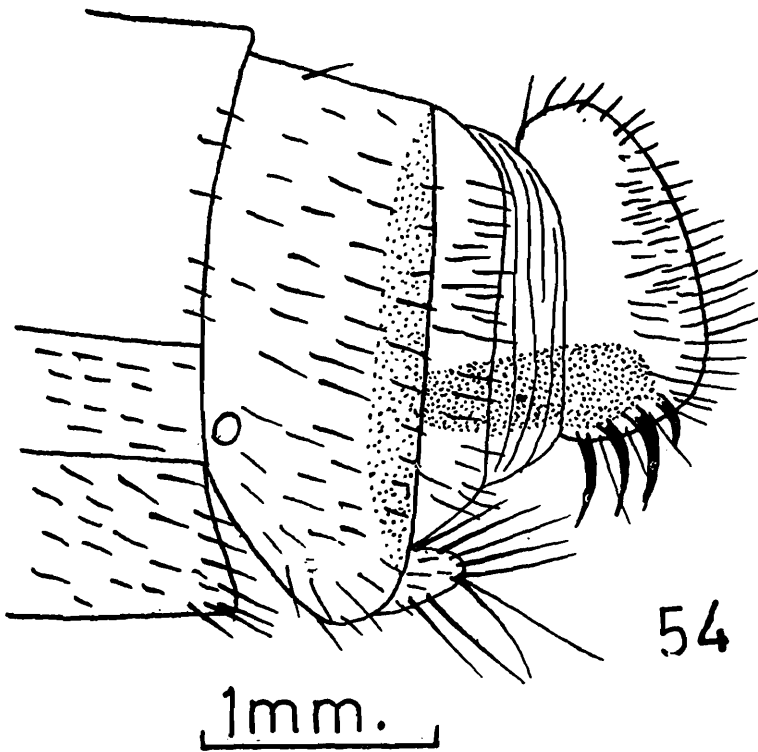
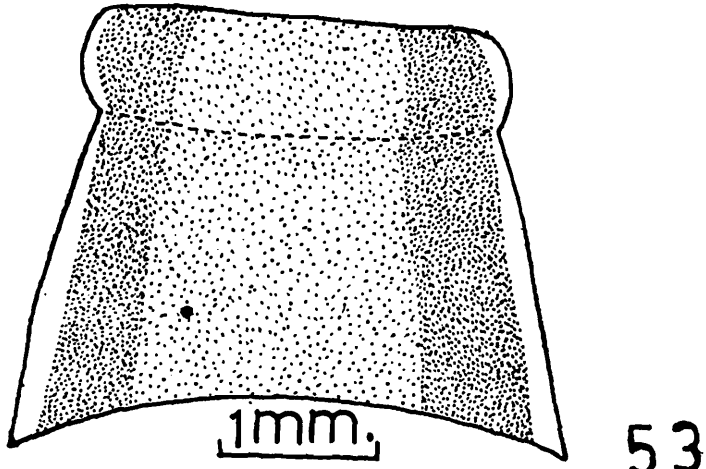
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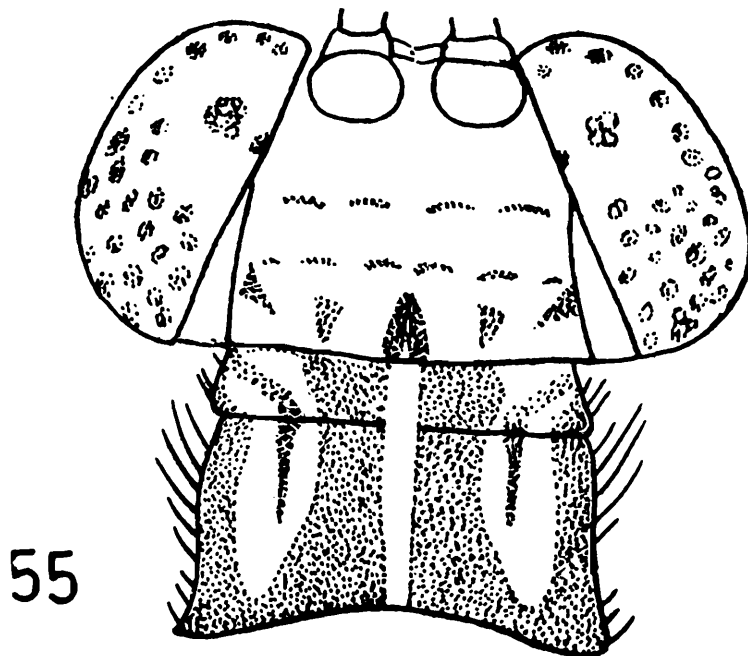
Text figs. 48-49. *Cueta bolangirensis*, sp. nov., female: 48. head and prothorax, dorsal; 49. tip of abdomen, lateral.



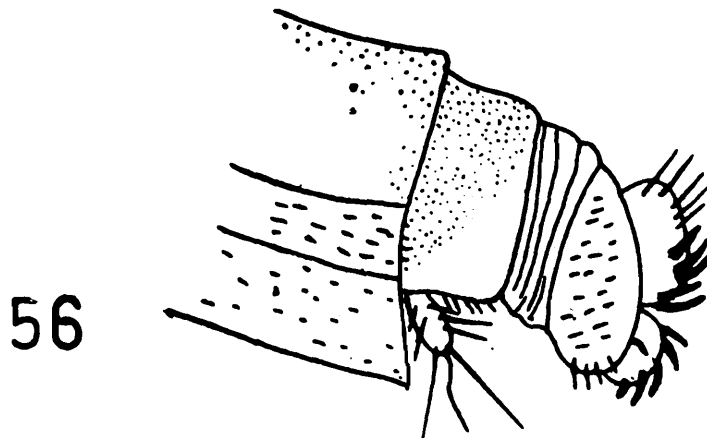
Text figs. 50-52. *Nesoleon perpunctatus* Banks: male: 50. tip of abdomen, lateral; 51. genitalia, lateral; female: 52. tip of abdomen lateral.



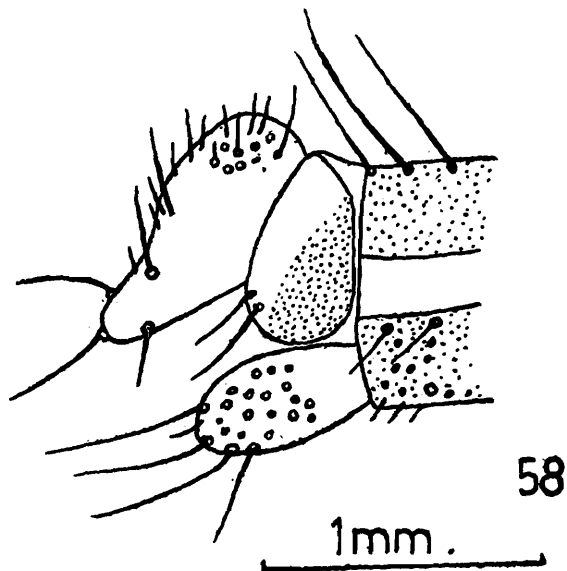
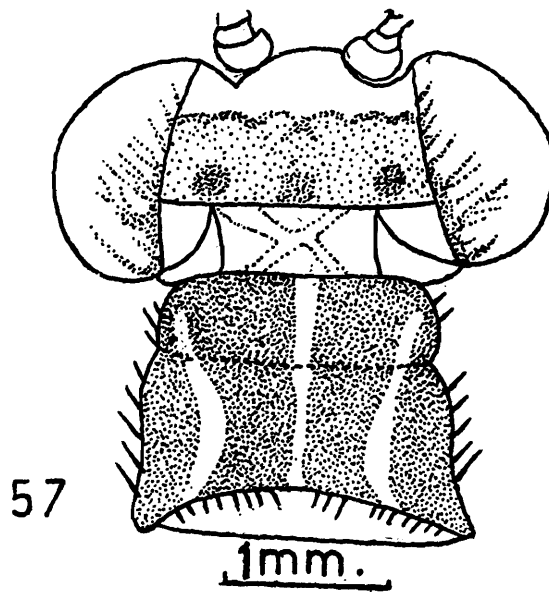
Text figs. 53-54. *Centroclisis horridus* (Walker): female: 53. prothorax, dorsal; 54. tip of abdomen, lateral.



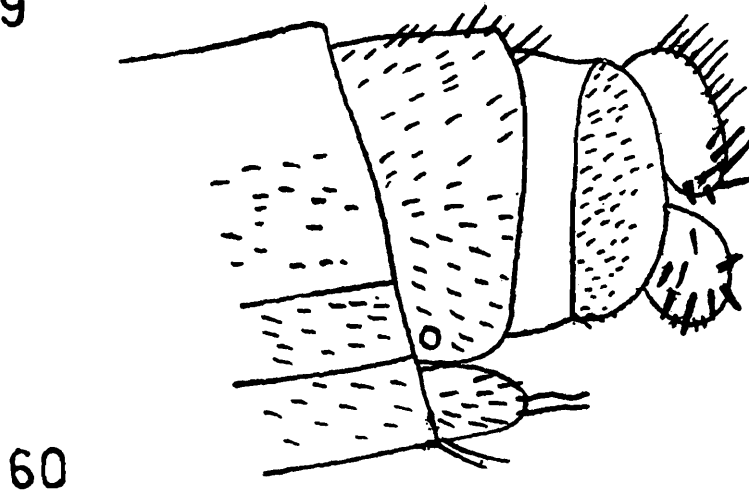
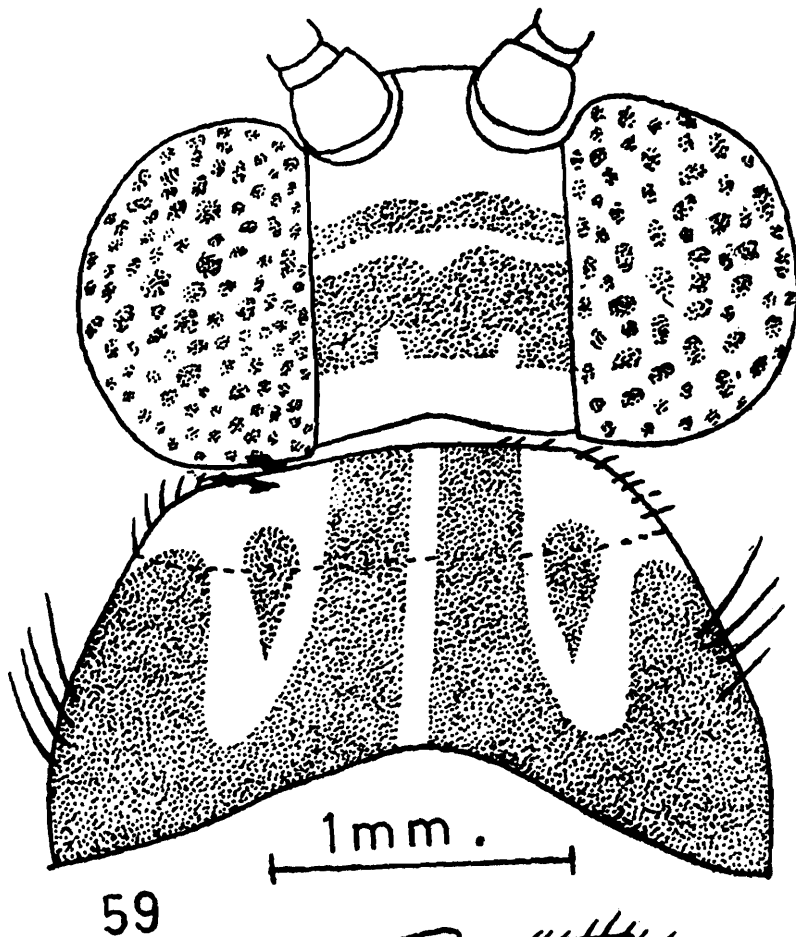
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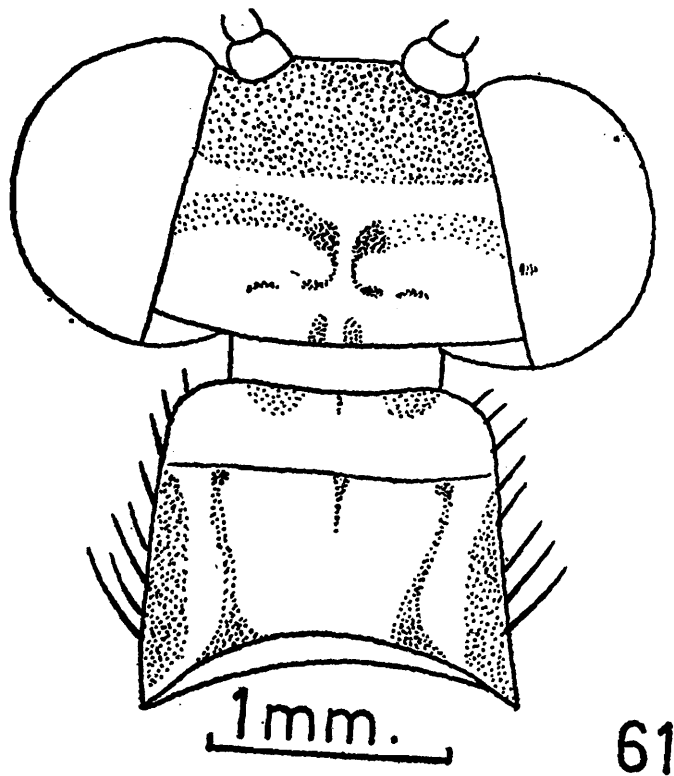
Text figs. 55-56. *Neuroleon guernii* Navas: female: 55. head and prothorax, dorsal; 56. tip of abdomen, lateral.



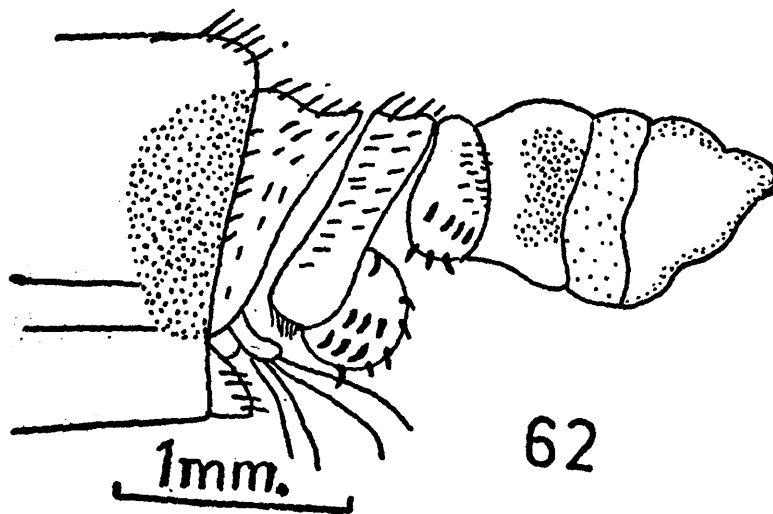
Text figs. 57-58. *Neuroleon guptai*, sp. nov., male: 57. head and prothorax, dorsal; 58. tip of abdomen, lateral.



Text figs. 59-60. *Neuroleon apicalis* Navas: female: 59. head and prothorax, dorsal; 60. tip of abdomen, lateral.

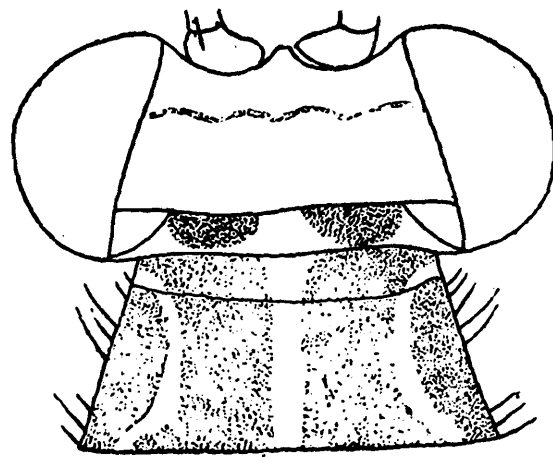


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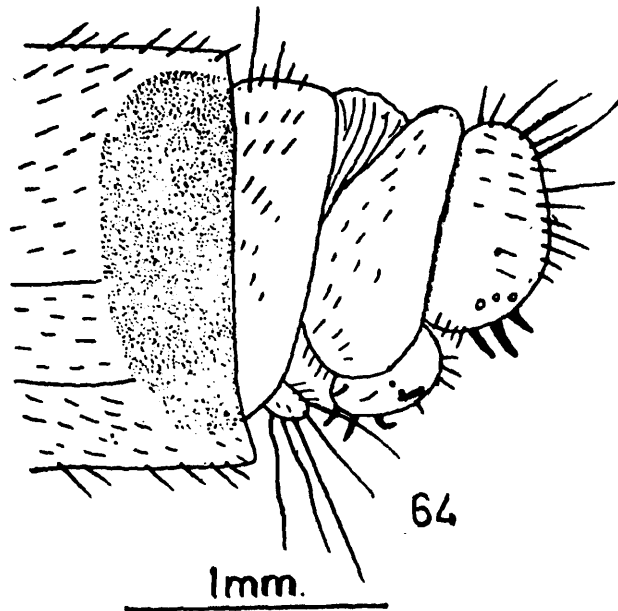


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Text figs. 61-62. *Macronemurus nefandus* (Walker): female: 61. head and prothorax, dorsal; 62. tip of abdomen, lateral.



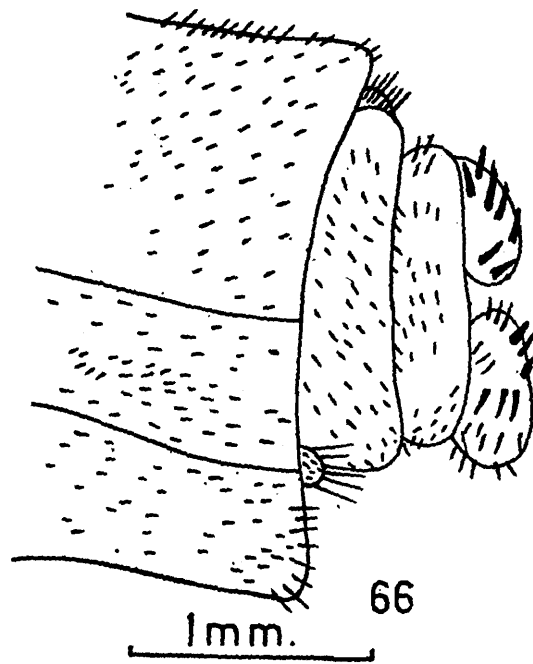
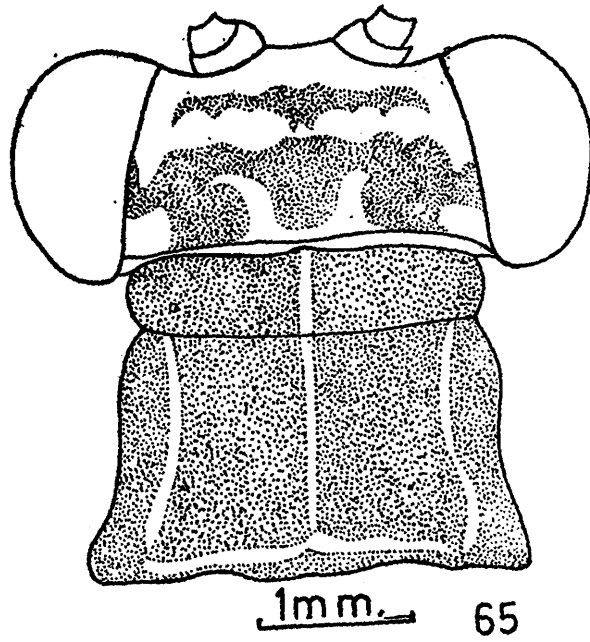
63 1mm



64

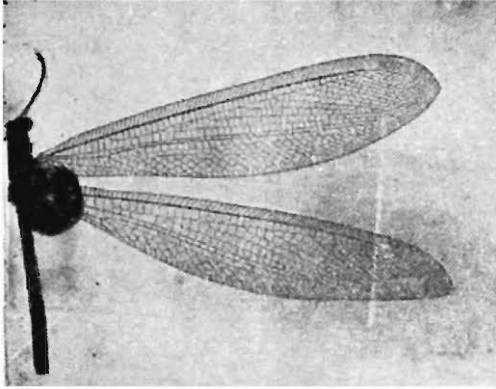
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Text figs. 63-64. *Distoleon bisoiensis*, sp. nov., female: 63. head and prothorax, dorsal; 64. tip of abdomen, lateral.

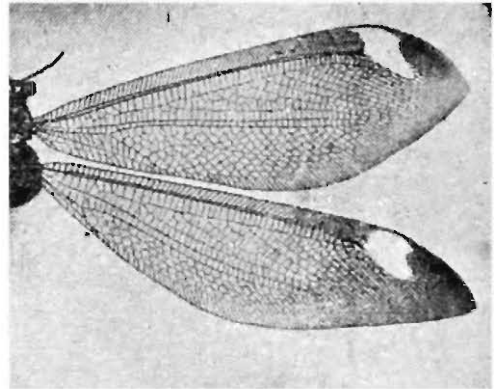


Text figs. 65-66. *Distoleon sambalpurensis*, sp. nov., female: 65. head and prothorax, dorsal; 66. tip of abdomen, dorsal.

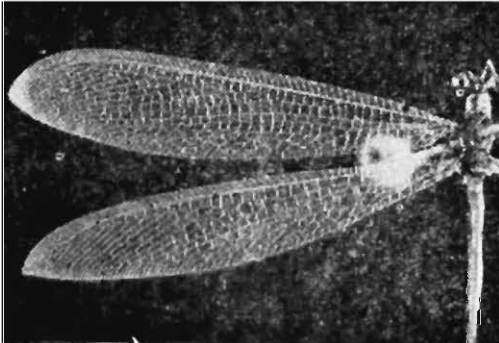




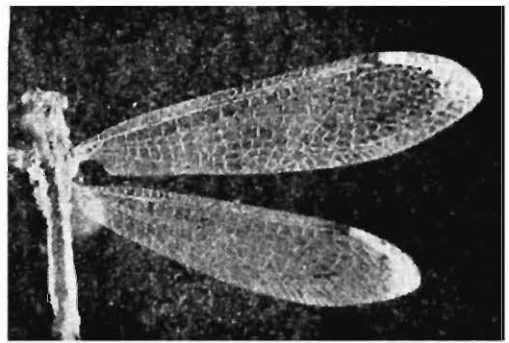
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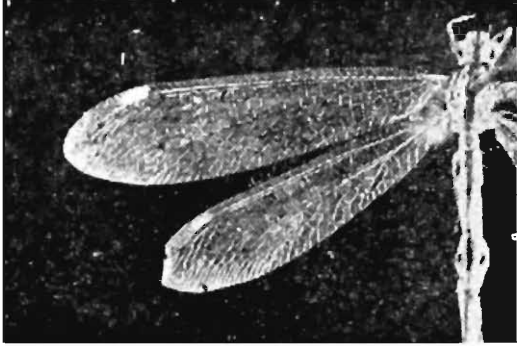


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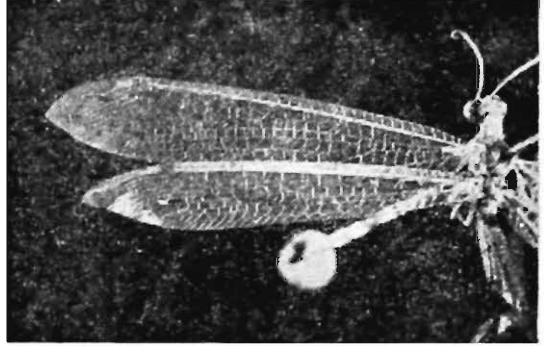


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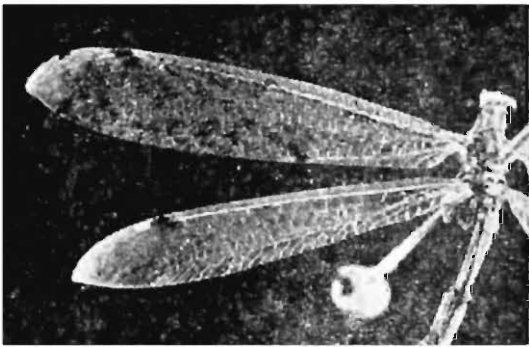
Pl. I. Figs. 1-4: 1. *Hagenomyia jamduarensis*, sp. nov., fore- and hindwing; 2. *Hagenomyia* sp., fore- and hindwing; 3. *Myrmeleon assamensis*, sp. nov., fore- and hindwing; 4. *Cueta bolangirensis*, sp. nov., fore- and hindwing.



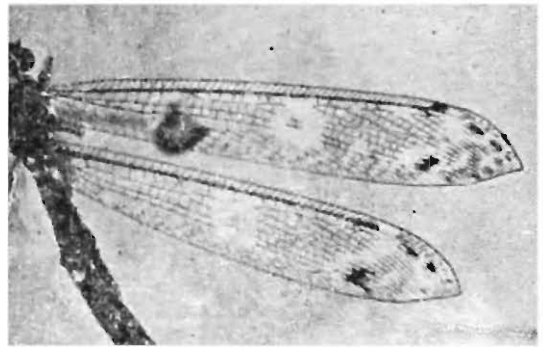
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Pl. II. Figs. 5-8: 5. *Cueta angulensis*, sp. nov., fore- and hindwing; 6. *Neuroleon guptai*, sp. nov., fore- and hindwing; 7. *Distoleon bisoiensis*, sp. nov., fore- and hindwing; 8. *Distoleon sambalpurensis*, sp. nov., fore- and hindwing.