INDIAN DRAGONFLIES

BY

F.C. FRASER, LT.-COL., I.M.S., F.E.S.

Part XXIX

(*With three plates.*)

(*Continued from page 319 of this Volume*)

Genus—RHINOCYPHA Ramb. (*cont.*)

Group—*perforata.*

Rhinocypha whiteheadi, Kirby, Ann. Mag. Nat. Hist, (7), vol. v, p. 536, pl. xii, fig. 4 (1894) ; Martin, Mission Pavie, Nevrop. (sep.) p. 17 ; Laid. Rec. Ind. Mus., vol. xiii, pp. 38 and 39, (1917) ; Fras. Mem-Pusa. (Ent. Ser.), vol. vii. No. 7, pl. viii, fig. 4 (1922)

Male. Abdomen 17 mm. Hindwing 21 mm.

Head : labium and labrum and rest of head velvety black marked with blue as follows :—a reniform or oval spot on the outer side of each hinder ocellus, a smaller postocular spot behind it and a medial linear occipital spot behind them.

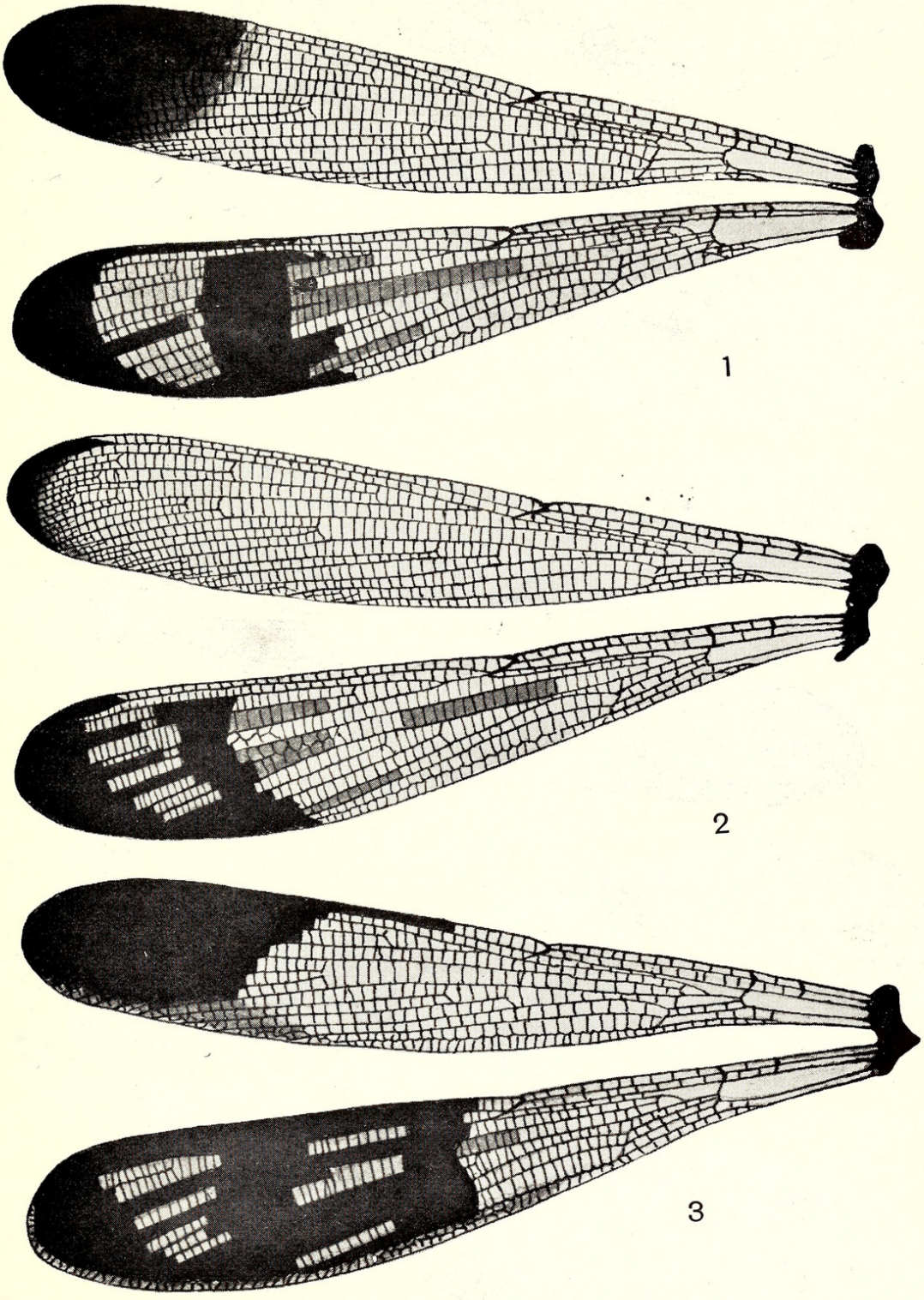
Prothorax black marked on each side with a rounded pale blue spot, and a large blue spot on the dorsum of posterior lobe and hinder portion of middle lobe, shaped like an arrow-head.

Thorax velvety black with a dark violet lustre, marked with azure blue and chrome-yellow as follows :—the mesothoracic triangle pale blue, extending considerably less than half-way up the dorsum of thorax, and very broad at base, far more so than in others of the genus ; an antehumeral stripe consisting of a small isolated spot above and a narrow curved stripe on the lower half of dorsum ; a fine posthumeral stripe closely apposed to the humeral suture, broken above to leave a small isolated spot, behind which is another elongate larger spot, all blue A broad interrupted stripe on lower part of sides, yellow, but the portion on the metepimeron, blue anteriorly. Pruinosed white beneath.

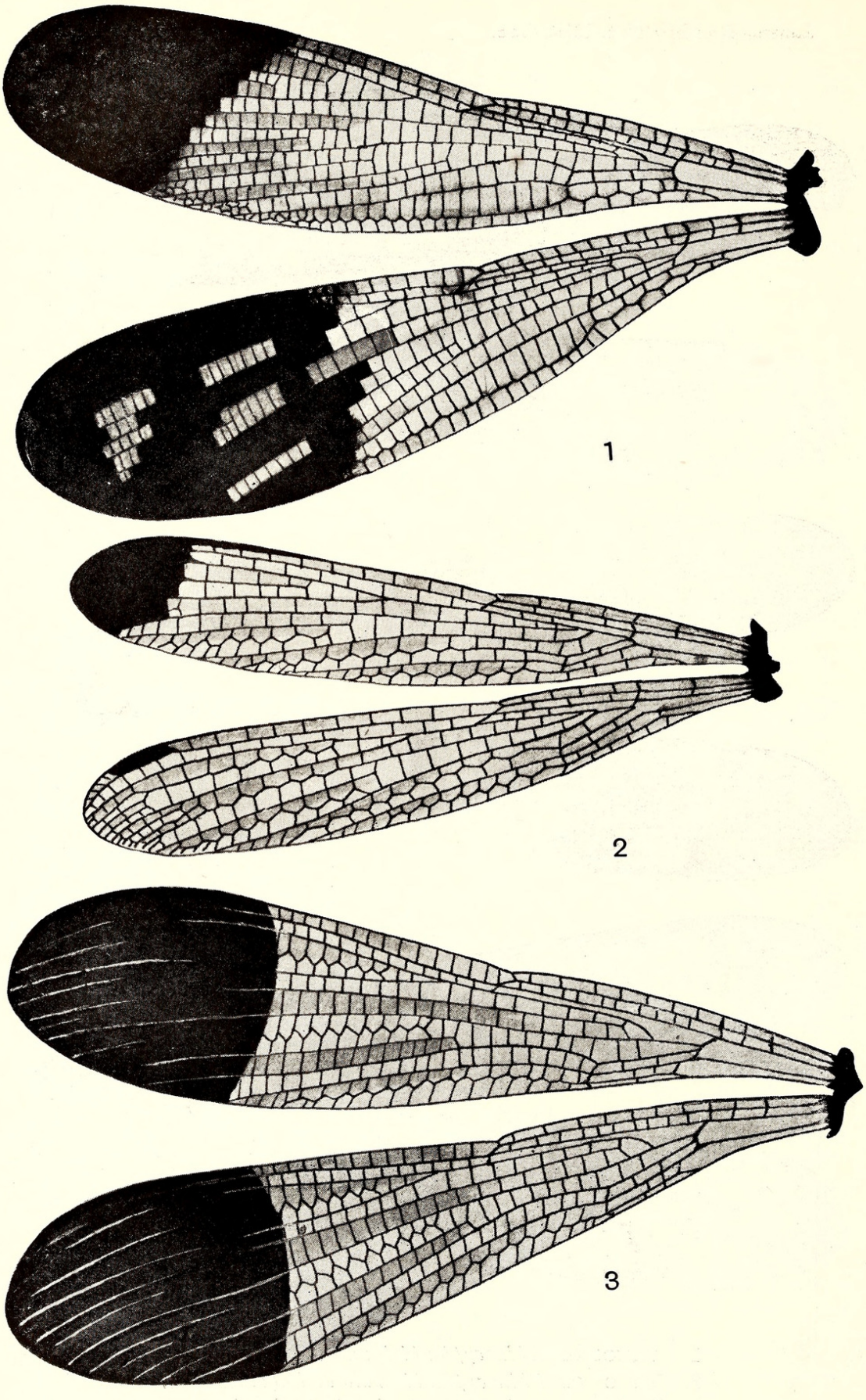
Legs black, the two hinder pairs of tibiæ, and the femora pruinosed white.

Wings hyaline palely tinted with yellow at the bases, opaque blackish brown apically, the hindwing marked on this part with three rows of vitreous spots. Forewings with the apical portion opaque blackish brown as far inwards as, rather more than half-way from apex to node, extending nearer the node along costal border of wing, the inner border of the area serrate and running obliquely backward and outwards ; pterostigma black, the cells immediately beneath it hyaline. Hindwing with opaque area darker and extending inwards for about three-fourths the distance between apex and node, its inner border very irregular, indented and serrate. The vitreous spots a beautiful violet from whatever angle viewed. The apical spot single, 4 cell-rows deep by 6 cells wide, irregularly shaped, situated 3 cell-rows behind pterostigma, which is black; the middle row of spots 3 in number, all in alignment and of about equal length, about 10 cells wide, the costal spot lying between *IRii* and *Riii*, the mid spot between *IRiii* and *Riv* + *v*, the hinder spot between *Cuii* and *IA* ; the proximal spot single, short, only 5 cells long, lying between *IRii* and *Riv* + *v*, projecting slightly into the opaque area. All wings with 14 to 15 antenodal nervures ; discoidal cell traversed 3 times in the forewing, 4 times in the hind ; wings petiolated to level of 2nd *an* ; 21 to 26 postnodals. Wings of approximately the same shape and length, long and narrow, the hind slightly broader than the fore.

Abdomen black marked with azure blue as follows :—segments 1 to 4 with lateral rounded spot at apical end of segments, growing successively smaller



1. WINGS OF *Rhinocypha bisignata*, Selys, male.
2. WINGS OF *Rhinocypha biforata delimbata*, Selys, male.
3. WINGS OF *Rhinocypha perforata perforata*, Perch, male.



1. WINGS OF *Rhinocypha whiteheadi*, Kirby, male.
2. WINGS OF *Micromerus lineatus*. Burn., male.
3. WINGS OF *Calocypha laidlawi* (Fras), male.

from 1 to 4, segment 1 has also the apical border narrowly lined with blue, and there is a short ventro-lateral stripe on segments 2 and 3. Anal appendages shaped as for genus ; inferior appendages with a series of small robust spines on upper surface.

Female. Unknown.

Distribution. Cachar, Assam. Very local but apparently not uncommon where found, to judge by the numbers taken by Mr. Antrim. Martin reports it from Tonkin, but I was unable to find any specimens in his collection in the Paris Museum, and infer that he has mistaken a race of *perforata* for this insect. There is a single male from Sibsagar, Assam, in the Indian Museum collection. Although belonging to group *perforata*, it is not very closely related to *perforata* itself, and cannot even be considered as a subspecies of that insect as has been suggested. Its wings are not only broader than *perforata* but are distinctly rounded at the apices. It ought not to be difficult to discover the female of this beautiful insect.

Rhinocypha perforata perforata Percheron. (*Agrion perforatus*), Gen. Ins. Neur. t, 2 (1835) ; Ramb. Ins. Nevrop., p. 235 (1842) ; Selys, Syn. Cal., p. 63 (1853) ; Id. Mon. Cal., p. 219 (1854) ; Id. Bull. Acad. Belg. (2), vol. xxxv, p. 487 (1873) ; Walk. (*Libellago perforata*), List. Neur. Ins. B.M., vol. iv, p. 647, No. 7 (1853) ; Kirby, Cat. Odon., p. 114 (1890) ; Mart. Mission Pavie, Nevrop. (sep.) p. 17 (1912) ; Will. Proc. U.S. Nat. Mus., vol. xxvii, p. 174 (1904) ; Krug. (*R. apicalis*) Stett. Ent. Zeit. p. 79 (1898) ; Laid. (*R. inas*) Proc. Zool. Soc., Lond., pp. 88–90, pl. vi, fig. 6 (1902) ; Id. (*R. apicalis*) Fascic. Malayensis (Zool), part 1, p. 196 ; Id. Rec. Ind. Mus., vol. xiii, pp. 38, 39, (1917) ; Fras. Mem. Pusa (Ent. series), vol. vii, pl. viii, fig. 3 (1922).

Rhinocypha perforata perforata is not found within Indian limits, but is represented by its subspecies or races *limbata* and *beatifica* described below. The type comes from Cochin China, and cotypes exist in the Maclachlan collection from the Isle of Hainan, China, collected by Swinhoe. It differs from *limbata* by not having the border of the apex of hindwing vitrefied hyaline and by the reduced opaque area in both fore and hindwings. In the forewing this area occupies a little more than the apical fourth, but in the hindwing extends to within four cells of the node. In *limbata* this area extends nearly up to the node in the forewings, but is variable in the hind, usually to about the same distance from the node, whereas in *beatifica* it extends right up to the node. Type in Paris Museum.

(In referring to my paper in the Memoirs of Pusa cited above, I note that the figures have been wrongly numbered in the plate. Figure 4 is really *R. whiteheadi*, and figure 3 should be *R. perforata limbata*.)

Rhinocypha perforata limbata, Selys, Bull. Acad. Belg. (2), vol. xlvii. p. 392, (1879) ; Kirby, Cat. Odon. p. 114 (1890) ; Laid. Rec. Ind. Mus., vol. xiii, p. 38 (1917).

Male. Abdomen 16–18 mm. Hindwing 25 mm.

Head : labium dirty white, the apices of lobes black ; labrum and rest of head velvety black with a small rounded spot on the outer side of each posterior ocellus, a larger rounded postocular spot and a linear medial spot on the occiput, all bluish.

Prothorax black with the greater part of the posterior lobe rose pink or lilaceous, and a large blue spot on either side of the middle lobe.

Thorax velvety black, the mesothoracic triangle extending rather more than one-third up the dorsum, lilaceous in colour. On the outer side of this triangle, and slightly longer than it, a large subtriangular azure blue spot with its hinder border meeting the anterior part of the humeral suture. Above this spot a small triangular upper humeral spot also blue, whilst laterally the greater part of the sides are of the same colour, viz., nearly the whole of the mesopimeron, the upper two-thirds of the metepimeron and a narrow prolongation along the hinder border of the humeral suture going as far as the root of forewings. Beneath thorax 2–4 yellow spots which may be somewhat obscured by pruinescence. In the Siamese and Annamese forms, there are only two small rounded spots at the hinder part of thorax, whereas in specimens from Assam, there are two additional larger oval spots in line with and in front of these.

Legs black, the flexor surfaces of the two hind pair of femora and tibiæ pruinosed white or creamy white.

Wings very long and very narrow, of equal breadth, hyaline in the basal portions where they are palely tinted with yellow; opaque blackish brown in the apical portions, marked with two series of vitreous spots in the hindwings. Forewings with the outer third only opaque, this area stopping short of the hinder border of wing, with a serrate border proximad and prolonged inwards along the costal border between the costa and *Ri*, to within 2–4 cells of the node; the hyaline border of wing posterior to the opaque area vitreous with bluish, violaceous or green reflex which may extend as far as the extreme apex of wing. Pterostigma black; 15 antenodal nervures, 24 postnodals; discoidal cell traversed twice only; petiolation ends at level of 2nd antenodal nervure. Hindwing with opaque area extending inwards to within 1 to 4 cells of node, the proximal border of this area ragged and indented deeply by a vitreous spot 8 or 9 cells long, between *IRiii* and *Riv* + *v*. The hinder border of wing narrowly hyaline and vitreous, finely reticulated and extending round apices of wing as far as pterostigma. The apical series of vitreous spots very variable, usually composed of 3 linear spots which decrease in length from costa to hinder border of wing and which slightly overlap the level of inner end of pterostigma. The costal spot 11 to 16 cells long, lying, between *IRii* and *Riii*; the hinder spot 3 cell-rows deep by 4 to 8 cells long, lying between *IRiii* and *Riv* + *v*, whilst the middle spot, which is 2 to 3 cell-rows deep by 9 to 10 cells long, lies midway between the two others banded by short intercalated sectors; the inner series lying rather nearer the node than pterostigma, composed of 3 spots, a costal spot 1 cell-row wide by 10 cells long, lying between *IRii* and *Riii*, a medial spot 2 cell-rows wide by 10 to 15 cells long between *IRiii* and *Riv* + *v*, and a hinder spot 1 cell row wide by 9 to 12 cells long between *MA* and *Cuii*. All these vitreous spots and areas glowing emerald green or opalescent according to the angle from which viewed; 28 postnodal nervures, 14 to 15 antenodals; discoidal cell traversed 3 to 4 times; petiolation the same as for forewing; pterostigma black.

Abdomen black marked laterally with azure blue as follows:—segment 1 with a large cuneiform spot on each side, 2 with a bilobed, longitudinal spot extending from near the base to apical border, 3 to 4 with long wedge-shaped spots with base of wedge at apical border of segments, segments 5 to 9 with short triangular apical spots, that on 9 being very reduced.

Anal appendages black, superiors slender, cylindrical, semi-circular, a little broadened at apex which is curved strongly in. Inferiors half the length of superiors, moderately separated, bluntly pointed, a little denticulated at apex. The superiors minutely spined on the outer sides near apex.

Female. Abdomen 18 mm. Hindwing 26 mm.

Differs from male by having the wings entirely hyaline, tinted palely with greenish yellow; pterostigma blackish brown, its outer half yellow at the centre, especially in the hindwings; 13 to 15 antenodal nervures in forewings, 26 to 30 postnodals.

Head similar to that of male with the addition of a large spot of yellow on upper surface of epistome and two smaller ones behind it. The spots on vertex and occiput also yellow, body-markings same as for male but yellow instead of blue, the mesothoracic triangle finely outlined in yellow, its centre black.

Legs black, tibiæ and femora not pruinosed. Abdomen black with yellow markings as for male, but with additional ventro-lateral stripes on segments 2 to 5. Vulvar scale as for genus.

Distribution. *Limbata* extends from Annam, through Siam to Burma and Assam. The type in the Selysian collection, is from East Burma. The type of *perforata perforata* is from Cochin China and is distinguished from *limbata* by the total absence of the hyaline and vitreous border of the hindwing, the opaque area here coming right down to the border of wing, at least along the extreme apex. The abdominal markings, said by Selys to be more restricted in *limbata*, are not found to be so when a series of specimens are examined. In the forewing at least, the opaque area is greatly reduced as compared to *limbata* or *beatifica*.

Rhinocypha perforata beatifica, Fras. Rec. Ind. Mus., vol. xxix, pp. 86–87 (1927).

Similar in size and markings to *limbata*, from which it differs by the greater extent of the opaque area in all wings, extending in the fore and hind right up

to the level of node. This is especially noticed in the forewings, where not only does the costal streak extend to node, but also the body of the area, the serrated border running from the node and extending as far as the apex of wing, leaving a rather broader area of hyaline border than is found in *limbata*. In the hindwing, the hyaline border broadens out at apex of wing, extending right up to, or even overlapping, the outer end of pterostigma. This latter has a narrow bluish centre in the hindwing along its outer half, and that of forewing is pale for the same extent. In the outer series of vitreous spots, the middle spot is 2 cell-rows deep and is fused completely with the costal spot, so that in reality there are only two spots in this series.

Distribution. Naga Hills, Assam, from April to June. Type in the Fraser collection. *Beatifica* differs from *limbata* to about the same extent as does the latter from true *perforata*, so that it is quite possible, that given sufficient material, it might be possible to construct a series showing a gradual merging of one into the others. For the present I consider it better to consider the *perforata* series as one species with two subspecies.

Rhinocypha biforata biforata, Selys, Bull. Acad. Belg. (2) vol. vii, p. 446 (1859) ; Id. ibid. (2), xlvii, p. 392 (1879) (*R. biforata*, race *delimbata*) ; Kirby, Cat. Odon. p. 113, (1890) ; Laid. Proc. Zool. Soc. Lond. (1), p. 88. (1902) ; Will. Proc. U. S. Nat. Mus., vol. xxviii, pp. 173 and 179, fig. 12, (1904) ; Laid. Rec. Ind. Mus., vol. xiii, pp. 37 and 38, (1917) ; Fras. (*R. beesoni*) Mem. of Pusa. (Ent. Ser.), vol. vii, No. 7, pp. 61 to 63, (1922).

Male. Abdomen 26 mm. Hindwing 23 mm.

The species is not found within Indian limits but is represented by its subspecies—*biforata delimbata* Selys, *biforata beesoni*, Fras, and *biforata abbreviata* subsp. nov. From all these *biforata* is easily distinguished by the greater extent of the opaque area in the hindwings, where it extends right up to the node or a little beyond it. The vitreous spots tend to be longer in *biforata* and the reticulation somewhat closer. *R. beesoni* falls closer to the parent species but curiously enough, is separated from it geographically by the intervention of the other two subspecies.

Rhinocypha biforata delimbata, Selys, Bull. Acad Belg. (2), vol. xlvii, p. 392 (1879) ; Kirby, Cat. Odon. p. 113 (1890) ; Will. Proc. U. S. Nat. Hist. Mus., vol. xxviii, pp. 173 and 179, fig. 12 (1904) ; Laid. Rec. Ind. Mus., vol. xiii, pp. 37 and 38 (1917).

Male. Abdomen 19–20 mm. Hindwing 23–26 mm.

Head velvety black marked with five bright ochreous spots, one-rounded or oval on the outer side of each posterior ocellus, a round postocular spot on each side and a medial oval occipital spot. Labium white, the lobes tipped with black.

Prothorax black, the posterior lobe finely bordered with yellow and with a large rosepink spot in its middle. A large bluish spot on each side near the trochanters and a similar subdorsal spot on each side of middle lobe.

Thorax velvety black marked as follows :—the mesothoracic triangle rosepink or lilaceous, extending less than half-way up the dorsum of thorax but continued as a fine line of the same colour along the middorsal carina as far as the antealar sinus. On each side of the mesothoracic triangle, a large irregularly oval spot of the same colour, much larger than the triangle itself, a small upper antehumeral spot, a broadish stripe behind the upper two-thirds of the humeral suture, the greater part of the mesopimeron, and metepimeron, azure blue. The hinder lateral suture, the lower part of the metepimeron, and a quadrate area on the upper anterior part of mesopimeron all black, the latter area bearing a small isolated blue spot. Beneath 6 large yellow spots separated by black sutures and framed narrowly in black.

Legs black, the two hinder pairs of tibiæ pulverulent white, the same two pairs of femora pulverulent yellow on the flexor surfaces.

Wings hyaline, the greater part enfumed and tinted with yellow, which is most intense near the bases. Forewings with apices tipped with blackish brown, this marking gradually shading off into the hyaline area at outer end of pterostigma (in *biforata biforata* this area begins well proximal of the pterostigma and covers about the outer fifth of the wing) ; discoidal cell traversed 3 times ; 14–16 antenodal nervures, 27–32 postnodals ; petiolation ends at the level of the

2nd antenodal nervure. Hindwings with about the apical fourth opaque blackish brown (the apical third or more in *biforata biforata*), this area marked with a series of four linear vitreous spots, very irregular, each varying in length, and the costal three often linked up by one or more connecting cells, the inner level of the spots forming a concavity towards apex of wing, as does also the inner border of the opaque area, which extends slightly more basad along hinder border of wing. Just proximal of the opaque area (projecting into it in *biforata biforata*) a second row of vitreous spots.

The costal one of these spots lying slightly nearer the node than pterostigma, composed of one row of cells, about 12 in number, lying between *IRii* and *Riii*, the second spot shorter, lying more distad, 2 cell-rows deep by 8 or 9 cells long, lying between *Riv+v* and *Riii*, the hinder spot at the same level as the costal, 9 cells long by 1 row wide, lying between *MA* and *Cuii*. In the same space as the medial spot of this series, but lying behind level of node, another vitreous spot 1 row wide by 11–18 cells long. Pterostigma black ; 15–16 antenodal nervures, 26 postnodals ; discoidal cell traversed 3 times.

Abdomen black marked with azure blue as follows :—a large triangular spot on each side of segment 1, a midsubdorsal and an apicolateral spot on each side of segment 2, as well as a ventro-lateral stripe below them ; similar spots and stripes, but longer, on segments 3 to 5 ; segments 6 and 7 with the ventro-lateral stripe only.

Anal appendages black, shaped as for genus.

Female. Abdomen 15–16 mm. Hindwing 23 mm.

Head black with the same markings as for male, but in addition, the bases of mandibles, the basal segments of antennæ, two large spots on frons and two minute linear spots in front and to the outer side of the anterior ocellus all yellow.

Prothorax black with the following yellow markings :—the hinder border of posterior lobe outwardly finely yellow, a narrow longitudinal medial line, often broken into minute points on the dorsum of same lobe, a geminate point at the anterior end of this on the medial lobe, a largish triangular spot on each side of midlobe and a rounded spot on each side of the anterior end.

Thorax black, marked with blue and yellow as follows :—the mesothoracic triangle finely mapped out in yellow, its centre black, a fine antehumeral line incomplete above and strongly hooked outwards and backward in front, a fine incomplete humeral line, all yellow. The sides similar to the male, blue.

Legs black, not pruinosed, the flexor surfaces of the hinder pairs of femora yellow.

Abdomen black marked exactly as for male. Vulvar scale and anal appendages as for genus.

Distribution. Burmah and Assam, common in parts of the former but apparently rare or local in the latter. I have specimens from Mergui, Lower Burma collected in November, and from Maymyo, Upper Burma, collected in July, the latter specimens by Col. F. Wall. It appears to be the commonest *Rhinocypa* in the Maymyo district.

The measurements differ widely from those given by Selys for *biforata*, but it is obvious that these are incorrect, at least those for the abdomen. The Maymyo specimens are very constant in their markings, especially with regard to the extent of the opaque areas of wings, so that I think *delimbata* should at least rank as a subspecies.

Rhinocypha biforata abbreviata subsp. nov.

In a male specimen from Assam, now in my own collection, and which I have named *abbreviata*, I note the following differences :—

The mesothoracic triangle is considerably smaller than in *delimbata* and the carina above it is unmarked ; the antehumeral spot is absent ; the forewings have only the extreme tips opaque and the nodal index is considerably lower, (12 antenodal nervures and 21 postnodals) ; the outer series of spots are discrete and all are much shorter than for type (12 to 13 cells for costal spot in *biforata*, only 6 in *abbreviata*, 18 cells in the second spot, only 14 in *abbreviata*, etc.).

The middle series of spots show the same difference, being only 4 to 5 cells in length and falling well short of the opaque area, although in the hindwing, this area is as extensive as in *biforata biforata*. Finally the proximal spot is only 8 cells in length. The nodal index of hindwing lower, 11 antenodals and 23 postnodals.

Abdomen with markings present on the first five segments only :—a large triangular blue spot on the sides of segment 1, an apical rounded spot, a short mid-lateral stripe and a ventro-lateral stripe on segment 2, segments 3 to 5 as for 2 but the medial stripes absent and the other markings much reduced.

The small size of this insect, the abbreviated vitreous markings, and the reduced abdominal markings are, I think, sufficient to form a well-defined subspecies, bearing the same relation to *biforata* as does *trimaculata* to *ignipennis*.

Rhinocypha biforata beesoni, Fras, Mem. Dept. Agricult. Ind. (Ent. ser.) vol. vii, No. 7, pp. 61 and 62 (1922).

Male. Abdomen 18 mm. Hindwing 25 mm.

R. beesoni shares the characters of *biforata* and *delimbata*, in that the apical opaque area of the forewings is as extensive as in *biforata*, and the same area in the hindwings is as reduced as in—*delimbata*. In—the forewing the opaque area extends 2 to 3 cells proximal of inner end of pterostigma, the inner margin somewhat irregular, bevelled outwardly from costa posteriorwards and prolonged slightly along the costa as far as half-way between pterostigma and node between the costal and radial nervures. There is also a slight prolongation along hinder margin of wing. In the hind wing the opaque area covers nearly the outer third of wing and the middle series of spots extends right up to it or even invades it for a short distance. The length of these spots is slightly greater than in *abbreviata*, but decidedly less than in *biforata* or *delimbata*. The vitreous spots in all these subspecies have a metallic green or coppery reflex in the opaque areas, violaceous in the hyaline area.

The discoidal cells are traversed 3 and 4 times respectively, the forewing has 14-15 antenodals, and 22-25 postnodals. The body markings are similar to those of *delimbata*.

Distribution. The type in the Forest Research Institute, Dehra Dun, comes from Lachiwala in that district, and was collected in the month of November. I have also seen two pairs in the Pusa collection which were collected at Mergui, Lower Burma, during June. There are no records of its having been taken in the vast stretch of country separating these two localities and it may be that some error in tabulating has crept in, for Mr. C. F. Beeson collected in Lower Burma as well as around Dehra Dun. It is easily distinguished from *delimbata* and *abbreviata* by the extent of the apical marking of forewing, and from *biforata* by the much reduced opaque area in hindwing.

Rhinocypha bisignata, Selys. Syn. Calop. p. 62. (1853); Id. Mon. Calop. p. 214. (1855) ; Walk. (*Libellago bisignata*) List. Neur. B. M. vol. iv. p. 648. No. 9, (1853) ; Kirby, Cat, Odon. p. 113, (1890); Laid. Rec. Ind. Mus. vol. xiii, p. 38, (1917) ; Fras. Mem. Pusa. Dept. Agric. (Ent. series) vol. vii, No. 8, pp. 80 and 81, pl. x (1922) ; Id. Rec. Ind. Mus. vol. xxvi, p. 483 (1924).

Male. Abdomen 20 mm. Hindwing 24-26 mm.

Head. Eyes brown, rest of head, including lips velvety black. A small spot external to each posterior ocellus, a similar postocular spot on each side and an occasional occipital spot all bright ochreous.

Prothorax black with a large yellow spot on each side of middle lobe, a similar spot on the outer ends of posterior lobe and a large rose-pink spot covering the greater part of dorsum of same lobe.

Thorax black marked as follows:—the mesothoracic triangle rose-pink, extending for more than one-third, but for less than half-way up dorsum of thorax ; a large oval spot of the same colour, pointed at both ends, bluntly so anteriorly, lying between the humeral suture and mesothoracic triangle, but well separated from latter, and of twice its length ; a small upper yellow antehumeral spot, a narrow yellow stripe bordering the upper half of humeral suture behind; a broad very broken stripe on hinder half of mesopimeron and the whole centre of metepimeron golden yellow. Beneath three pairs of yellow spots, the hind the larger, the middle pair obscured. Legs black, the two hinder pairs of tibiæ and femora pruinosed white on flexor surfaces.

Wings long and narrow as in *biforata*, the hind slightly broader than the fore, hyaline in the basal portions, where they are tinted with yellow, opaque blackish brown in the apical areas, the hind bearing here a large vitreous fuliginous spot. Forewings with the outer fourth or more opaque, this area

being briiliant coppery or with fiery reflex as in *ignipennis*, with its inner border prolonged slightly basad between costa and *Ri* and running obliquely out towards the hinder border of wing. Hindwing with the inner third opaque and marked with two series of vitreous spots which glow with a coppery reflex, or violaceous, the inner spot always the latter colour. The outer spot produced by a fusion of similar spots to those seen in *biforata*, but often completely or partially divided into two or more spots, lying between *Rii* or *MA* or *Riv+v*, and its outer border on a level with the middle of pterostigma. The inner series composed of 3 vitreous spots similar to those seen in *biforata* but the middle one usually prolonged inwards to fuse with the nodal spot seen in *biforata*. The first spot of this series one row deep by 8 cells long, lying between *IRiii* and *Riv+v*, the middle spot 20-22 cells long when fused with the nodal spot, otherwise only 10 cells long, lying between *IRiii* and *Riv+v*, the hinder spot 11–12 cells long, lying, between *MA* and *Cuii*. Pterostigma black in all wings ; nodal index 12–14 antenodals and 28–31 postnodals in the forewings, 12–14 antenodals and 22-28 postnodals in the hind ; discoidal cell traversed 2–3 times in forewings, 3–6 in the hind; petiolation begins slightly proximad of the 2nd antenodal.

Abdomen black marked with yellow as follows :—segment 1 with a sub-triangular lateral spot on each side ; segment 2 with a midlateral stripe, an apical spot and a ventro-lateral stripe ; 3 and 4 similar to 2, but the mid-lateral spot obsolete, whilst 5 has the apico-lateral spot only. All other segments unmarked.

Anal appendages as for genus, the inferiors minutely spined above.

Female. Abdomen 16 mm. Hindwing 22 mm.

(Although so common an insect, and known for so long a time, the female of this insect has hitherto escaped description).

Head. Labium bluish green tipped with black ; labrum black with a large oval or triangular yellow spot on each side ; cheeks broadly yellow, this colour continued up as a narrow bordering to eyes as far back as the level of the posterior ocellus, the basal segments of antennæ, a small triangular spot low down on sides of epistome, two large triangular spots on the upper surface of frons, two transversely oval spots just behind these lying in front and to outer side of anterior ocellus, all yellow ; a small rounded spot on the outer side of each posterior ocellus, a rounded postocular spot on each side and a mid-occipital spot, triangular in shape all bright ochreous.

Prothorax black with a large yellow spot on each side and the borders of the posterior lobe finely yellow laterally.

Thorax as for male but the large antehumeral spot replaced by a fine ante-humeral line incomplete above, whilst the mesothoracic triangle is black, finely outlined in yellow, as also the middorsal carina. Legs black, not pruinosed.

Wings entirely hyaline, tinted palely with yellow, the apices narrowly en-fumed ; pterostigma black with pale creamy centre ; discoidal cell traversed twice, or more rarely, thrice in all wings ; 12–14 antenodal nervures, 21–27 post-nodals in forewings, 19–24 in the hind.

Abdomen black marked with yellow as for male but rather more extensively, thus segments 3 to 5 are marked similarly to 2, and 6 and 7 similar, the remainder unmarked.

Anal appendages and vulvar scale similar to genus.

Distribution. This species is the sole representative of the genus in Southern and Peninsular India. It is a widely distributed insect, thus I have records of its capture in localities as wide apart as Cochin and the Central Provinces. It is common throughout the Palnai, Nilgiri and Shevaroy Hills in the far south, abundant in Coorg, less common at Khandala and Igatpuri on the ghats near Bombay, lastly it is widespread throughout the Agency Tracts and Jeypore on the East Coast. Its exact limits here are yet to be worked out but it probably stops short of Bengal. It is a submontane insect, living and breeding between 2,000 to 5,500 feet altitude. Its larva was discovered in the Nilgiris and—was one of the first to be described of the genus. The females congregate on the bare twigs of neighbouring trees in great numbers and are very rarely seen pairing. Occasionally they may be seen ovipositing on a piece of dead twig floating in mid-stream. The males frequently disport in couples before the females, circling and sparring with one another, their white pruinosed legs glistening and thrust out like the arms of a wrestler seeking for an opening. Meanwhile their wings flash like living jewels of fire.

FIG. 1.

FIG. 2.

1 AND 2. TWO VIEWS OF THE CAUVERY RIVER NEAR FRASERPET, COORG, WHERE *Rhinocypha bisignata* AND *Micromerus lineatus* ABOUND. OTHER DRAGONFLIES TAKEN IN THESE SPOTS WERE *Chloroneura apicalis* AND *quadrimaculata Zygonyx isis*, *Macromia indica*, *Macromidia donaldi*, *Onychothemis testacea ceylanica*, ETC.

Genus CALOCYPHA, gen. nov.

Moderately small but robust insects with characters similar to those of *Rhinocypha*, differing mainly in details of venation and the greater petiolation of wings. Head, thorax, abdomen and legs similar to *Rhinocypha*. Wings equal in length, similar in shape, apices markedly rounded, reticulation more open than in *Rhinocypha*, hyaline with opaque apices; the arc very oblique, lying almost in the same line as the costal border of discoidal cell, the latter shorter than in most *Rhinocypha* and acutely pointed outwardly; petiolation beginning at or well distad of the inner end of discoidal cell; the nervure *ac* situated more basad than in *Rhinocypha*; anal appendages slenderer, the superiors twice the length of segment 10, narrow, cylindrical, curving in at apices which are bluntly pointed, furnished with a few hairs. Inferiors much shorter, half the length of superiors, broad at base, directed directly back and parallel to one another, furnished with a few minute spines on upper surface.

Female with apices of hindwings partially opaque, the venational details as for the male. Vulvar scale and anal appendages as for genus *Rhinocypha*.

Calocypha laidlawi (Fras.) (*Rhinocypha laidlawi*) Rec. Ind.Mus., vol. xxvi, pp. 482, 483 (1924).

Male. Abdomen 17–18 mm. Hindwing 20 mm.

Head black marked with bright vermilion as follows:—a large oval spot on dorsum of anterior part of epistome, a pair of large subtriangular spots behind the former on frons, two large tongue-shaped spots on vertex nearly confluent with former, closely apposed to the ocelli which they partially enclose. The latter spots changing from vermilion to pale ochreous at their hinder ends; a postocular spot on each side of occiput of the same colour. Eyes dark brown; labium pale yellow; labrum glossy black.

Prothorax black marked with creamy yellow as follows:—a narrow anterior collar, an oval spot on each side of middle lobe, a spot on each side of posterior lobe and a large spot on trochanters.

Thorax black, the mesothoracic triangle very narrow, very elongate, extending the whole length of dorsal carina, expanded in its lower third, with parallel sides in its upper two-thirds, bright vermilion red. The central part of alar sinus creamy yellow, laterally the lower parts of sides azure blue save for a small triangular area posterior to the humeral suture and a small linear spot on upper part of 2nd lateral suture. The dark area in front bearing a small upper posthumeral blue spot. Beneath thorax six large rounded yellowish spots, the anterior pair confluent.

Wings hyaline, the bases tinted with yellow, rather less than the apical thirds of all wings opaque black with a dark violety metallic reflex, the margin of this opaque area straight and sharply defined, not bearing any clear vitreous spots or stripes. Pterostigma black, swollen outwardly, oblique at both ends.

Legs black, the flexor surfaces of the two hinder pairs of tibiæ pruinosed white, the same pairs of femora very slightly so.

Abdomen black marked with bright azure blue on segments 1 to 8. Segments 1 to 3 broadly blue on the sides from base to apical border, segments 4 to 8 with a broad wedge-shaped spot tapering apicad but not reaching apical border of segments, gradually diminishing in size from 4 to 8. Segments 2 to 8 with narrow paired basal subdorsal blue lunules. Anal appendages black.

Female. Abdomen 17 mm. Hindwing 24 mm.

Differs from the male by the markings bright pale ochreous instead of vermilion and azure blue, and by its forewings entirely hyaline.

Head black marked with pale ochreous as follows:—two large oval spots on labrum covering the greater part of its surface, the same series of spots on upper surface of epistome and frons as seen in male, the bases of mandibles and a narrow stripe alongside each eye, as far as level of ocelli, the basal segments of antennæ, a small spot on each side of epistome, and lastly, the same postocular spots as seen in the male.

Prothorax similar to male but the middorsum bearing a stripe which runs from posterior lobe nearly to anterior end of prothorax.

Thorax black marked with greenish yellow as follows:—two minute spots on the antealar sinus, the middorsal carina finely, a fine antehumeral stripe, its anterior end curling abruptly outward, a short posthumeral stripe, incomplete below, a still shorter vestigial stripe just posterior to the upper part of first

lateral suture, a long stripe traversing the whole length of sides, crossing both sutures obliquely, its upper and lower borders very irregular and serrate.

Legs black, femora a dirty yellow on inner sides.

Wings hyaline, the hind with the apices broadly brown as far proximal to the inner end of pterostigma as its own length, and of a much deeper tint in the hinder two-thirds of wing. Anteriorly the cell-middles are hyaline, whilst at the apex of wing, the brown area is replaced by a small opaque white area. Pterostigma with inner half black, outer half whitish margined with black. Antenodal nervures 10 to 11 in forewings, postnodals 18 to 19 (10 to 11, and 18 to 24 in the male) ; discoidal cell of forewings traversed once only, rarely twice, in both sexes, 2 to 3 times in the hindwings. Petiolation beginning at inner end of discoidal cell in the female.

Abdomen black marked with bright ochreous and greenish yellow :—segment 1 with a large lateral spot and a minute middorsal linear apical spot, all segments from 2 to 8 with the middorsal carina finely yellow and from 2 to 7 with a long narrow stripe followed by a large apical spot on each side, whilst beneath this marking, on all segments, is a superventral stripe ; remaining segments unmarked.

Anal appendages black, long, acuminate. Vulvar scale as for genus.

Distribution. Confined to South Kanara, to the net-work of rivers about Sulia. I well remember the first discovery of this beautiful insect, when in company with Mr. C. A. Souter, I was making my way up the bed of the river in the Coorg—S. Kanara enclave. We had come to a fork in the stream and agreed to part company, each to work his own branch of the fork. Shortly afterwards I came on my first specimen which I mistook for a *Pseudagrion rubriceps*. Its size and conspicuous colouring led me however to glance at it a second time, when I at once recognized that it was something altogether new. I took eight males in all and when I rejoined my fellow shikari, found that he too had made the same discovery, having taken four more males (Nov. 9, 1923). Mr. Souter discovered the female on this same river in the following April, where I again found it later. For a long time, the discovery of a second species of *Rhinocypha* in South India has been visualized by Dr. Laidlaw and myself, so that it was very gratifying to come upon this insect. Dr. Laidlaw has pointed out to me the marked differences in venation and has suggested the removal of the insect from genus *Rhinocypha*, a suggestion here carried out. The type and co-type in the British Museum. Paratypes in the Fraser, Ris, Laidlaw, Morton, Pusa and Inglis' collections. The insect is a shade lover, albeit its bright colouring. It is found perched on half-submerged logs in midstream, or resting on twigs overhanging the river. The reds and blues are very conspicuous when the insect is in flight, whilst the black tips form an almost complete circle round it as the wings whirl with cinema effect.

Genus, LIBELLAGO, Selys.

Selys, Syn. Cal., p. 57 (1853) ; Id. Mon. Cal. p. 226 (1854) ; Walk. List. Neur. Ins. Br. Mus. vol iv, n. 643 (1853).

Moderately robust insects with characters very similar to genus *Rhinocypha* but differing less from that genus than does *Calocypha*.

Head, thorax and abdomen similar to *Rhinocypha*, but mesothoracic triangle undeveloped and uncoloured ; the abdomen, on the other hand, of the males, usually brilliantly coloured. Wings entirely hyaline in both sexes, narrow, the hind not noticeably broader than the fore, venation close, similar to that of *Rhinocypha*, except *MA* which is more or less zig-zagged for at least the outer part of its course, so that the cells bordering it are pentagonal instead of rectangular as in *Rhinocypha ;* petiolation ends well proximad of the inner end of discoidal cell. Legs variable, similar to *Rhinocypha* in the single Asiatic representative, similar to *Rhinocypha*, or widely dilated, in African species and usually brilliantly coloured. Anal appendages and genitalia very similar to *Rhinocypha*.

Distribution. Only a single species has been recorded from Asia, *L. asiatica vittata*, which extends through Burma and Tonkin, to the Philippines where it is represented by *L. asiatica asiatica*. The genus although so closely allied to *Rhinocypha*, is essentially an African one, and it is doubtful whether *asiatica* should be included in it, as the venational differences seperating it from *Rhinocypha* are not nearly as marked as they are in the African species of the

genus, nor is the abdomen marked as brilliantly as in the latter. The Asiatic species may be regarded as a link bridging the gap between the two genera, and raises a point of profound interest as to how, when and where the passage took place. Genotype—*Libellago dispar* Beauv.

Libellago asiatica vittata Selys, Ann. Mus. Civ. Genov. (2a), x, (xxx), pp. 58, 59 (1891); Will. Proc. U.S. Nat. Mus., vol. xxviii, p. 173 (1904); Mart. Mission Pavie, Neuropteres (sep.), p. 17 (1901); Laid. Rec. Ind. Mus., vol. xiii, pp. 39, 40 (1917).

Male. Abdomen 23 mm. Hindwing 33 mm.

Head black unmarked; prothorax black unmarked.

Thorax black with a fine posthumeral yellow stripe and two oblique dark ochreous bands on the sides. Legs black.

Wings hyaline suffused with brown at extreme bases, especially in the subcostal and median spaces as far as the basal antenodal nervure; 16 antenodal nervures, 19–22 postnodals in forewings, discoidal cells traversed twice or thrice; pterostigma black, about 2 mm. in length.

Abdomen black marked with reddish brown, segments 1 and 2 entirely black, dorsum of segments 3 to 8 reddish brown, the sides yellow, as well as the dorsal carina finely; apices of segments narrowly, and the whole of segments 9 and 10 black. Anal appendages black, superiors twice as long as segment 10, slender, curving in towards their apices which are a little spatulate; inferiors cylindrical, separated, curving in at apices, about half the length of superiors.

Female. Abdomen 20 mm. Hindwing 30 mm.

Head. Labium black; labrum black with a large diffuse rounded central spot of pale yellow; bases of mandibles, a large spot on the sides of epistome, another on the sides of frons, the basal segments of antennæ, the cheeks broadly, a small oblique spot on the outer sides of the posterior ocelli and a rounded postocular spot on each side of occiput pale creamy yellow.

Prothorax black, the lateral ends of posterior lobe and a large spot on each side of middle lobe pale yellow.

Thorax black marked with a pale greenish yellow antehumeral stripe incomplete above, where however, is an isolated spindle-shaped spot of ochreous; a bright ochreous elongate posthumeral upper spot, at the lower end of which, and on the dorsal side of the humeral suture, is a somewhat smaller triangular spot; laterally the whole of the lower half of mesopimeron, and the whole central portion of the metepimeron as well as a small curved stripe behind the upper part of the first lateral suture bright ochreous. Beneath thorax a broad transverse stripe behind the legs, followed successively by a large arrow-head shaped spot and a broad terminal stripe all ochreous.

Legs black, coxæ and trochanters yellow, proximal ends of all femora yellowish brown.

Wings hyaline, the extremity of all apices clouded narrowly with blackish brown; 15 to 16 antenodal nervures in forewings, and 17 to 18 postnodals, 16 antenodals and postnodals in hindwings. Discoidal cells traversed thrice; the nervure *ac* well proximad of inner end of discoidal cell; petiolation beginning at level of 2nd antenodal; pterostigma blackish brown, longer than in male.

Abdomen black marked with yellow as follows:—segments 3 to 8 with a narrow middorsal carinal stripe, segments 1 to 7 with the sides broadly yellow, this colour expanding dorsalwards at apical ends of segments; segment 8 with a rounded apico-lateral spot.

Anal appendages black, long and narrow, pointed. Vulvar scale as for *Rhinocypha*, black with a large medio-lateral bright yellow spot.

Distribution. Bhamo, Burma, within Indian limits, June and July. Reported also by Martin from Tonkin. Type in the Selysian collection. Appears to be a rare insect wherever taken.

(*To be continued.*)

Note:—In part xxvii, Indian Dragonflies of this volume, by a printer's error, the figures have been transposed. Fig. 1 should be Fig. 2 as regards the explanatory text, and *vice versa*.