

with everywhere; I have occasionally found it at Ooty, Nilgiris, at an altitude of 7,250 ft. It breeds in small tanks and also pools in river beds when these latter fall low. There is no difficulty in distinguishing the adult male by its unique violet-coloured abdomen, quite different to the red of *chrysis* and *testaceum*.

The *type* is in the Marchal collection at Oxford. Specimens of both sexes in all national collections.

Genus **LIBELLULA** (Linnaeus). (Fig. 93.)

- Libellula* Linnaeus, Syst. Nat. ed. x, p. 543 (1758); Burmeister, Handb. Ent. vol. ii, p. 847 (1839); Charpentier, Lib. Eur. p. 11 (1840); Rambur, Ins. Névropt. pp. 26, 32 (1842); Hagen, Syn. Neur. N. Amer. p. 150 (1861); Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, pp. 366, 729 (1868); Kirby, Trans. Zool. Soc. Lond. vol. xii, pp. 260, 284 (1889); Karsch, Berlin Ent. Zeit. vol. xxxiii, p. 356 (1890); Kirby, Cat. Odon. p. 24 (1890); Calvert, Proc. Calif. Acad. (2) vol. iv, p. 472 (1895); Needham, New York State Mus. Bull. vol. xlvii, p. 530 (1901); Calvert, Biol. C. Amer., Neur. pp. 198-206 (1905); Ris, Cat. Coll. Selys, fasc. xi, p. 245 (1910); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, pp. 149, 150 (1918); Schmidt, Die Tierwelt Mitt. Eur. (Libellen), Band iv, Lief. 1, 6, p. 50 (1929).
- Platetrum* Newman (pars), Ent. Mag. vol. i, p. 511 (1833); Calvert, Biol. C. Amer., Neur. p. 198 (1905).
- Leptetrum* Newman (pars), Ent. Mag. vol. i, p. 511 (1833); Kirby, Trans. Zool. Soc. Lond. vol. xii, pp. 260, 286 (1889); Karsch, Berlin, Ent. Zeit. vol. xxxiii, p. 356 (1890); Kirby, Cat. Odon. p. 26 (1890).
- Plathemis* Hagen, Syn. Neur. N. Amer. p. 149 (1861); Kirby, Trans. Zool. Soc. Lond. vol. xii, pp. 260, 286 (1889); id., Cat. Odon. p. 28 (1890); Karsch, Berlin Ent. Zeit. vol. xxxiii, p. 356 (1890); Calvert, Biol. C. Amer., Neur. pp. 198, 205 (1905).
- Belonia* Kirby, Trans. Zool. Soc. Lond. vol. xii, pp. 260, 288 (1889); Karsch, Berlin Ent. Zeit. vol. xxxiii, p. 356 (1890); Kirby, Cat. Odon. p. 28 (1890).
- Holotania* Kirby, Trans. Zool. Soc. Lond. vol. xii, pp. 261, 288 (1889); Karsch, Berlin Ent. Zeit. vol. xxxiii, p. 356 (1890); Kirby, Cat. Odon. p. 29 (1890).
- Ladona* Needham, New York State Mus. Bull. vol. xlvii, p. 528 (1901).

Dragonflies of rather large size and robust build, variably coloured, and with wings often partly coloured or opaque. Head of medium size; eyes only shortly contiguous; frons broad and with well-defined crest but rather variable; sulcus deep; vesicle rounded or bifid. Prothorax with small posterior lobe; thorax robust; legs short and robust, hind femora with numerous rather closely-set, very short spines, increasing in length distally and with one or two longer ones at extreme end; armature similar in the sexes. Wings long, often partly coloured, reticulation close; discoidal cell of fore-wing a little distal to level of the hind; all discoidal

cells traversed, that of fore-wing sometimes several times, that of hind-wing with its base at arc or slightly proximal; arc situated distal or proximal to the second antenodal nervure; sectors of arc separated in fore-wing, fused for a very short distance in hind-wing; *Cu*₁ arising from posterior angle of discoidal cell in hind-wing; antenodal nervures numerous, distal one complete; 1 cubital nervure in fore-wing, 1 or more in the hind; supplementary nervures present in the bridge; subtrigone in fore-wing made up of 3 or more cells; hypertrigones traversed or entire; 2 or 3 rows of cells between *IR*₁ and *Rs*₁; discoidal field with 3 to 6 rows of cells, dilated widely at border of wing; *R*₁ markedly undulated; anal loop elongate, distal end dilated, distal side angulated; membrane large; pterostigma variable, small or very large.

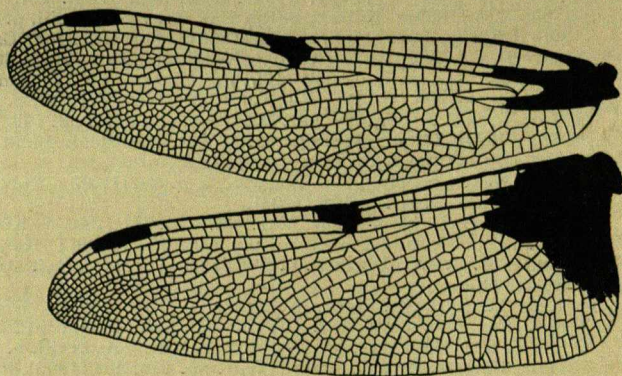


Fig. 93.—Wings of *Libellula quadrimaculata* (Linn.), male.

Abdomen variable in shape, usually broad at base, and tapered from thence to anal end or very broad and markedly depressed. Genitalia: hamules small and inconspicuous; border of segment 8 in female variable; vulvar scales very small or obsolete.

Genotype, *Libellula depressa* Linn.

Distribution.—Throughout Europe, Central and N. Asia, and N. America and Japan. Only one species of this large genus has been reported from within our limits, and this only from KASHMIR. Species of *Libellula* breed in weedy ponds, tanks, and slow-flowing rivers or canals. Their habits are very similar to those of *Orthetrum*, which they much resemble in build and often in appearance, but the separated sectors of the arc will serve to distinguish species from that genus.

471. *Libellula quadrimaculata* Linnaeus. (Fig. 93.)

Libellula quadrimaculata Linnaeus, Syst. Nat. ed. x, p. 543 (1758); id., ibid. ed. xii, p. 901 (1766); Fabricius, Syst. Ent. p. 420 (1775); Burmeister, Handb. Ent. vol. ii, p. 861 (1839); Charpentier, Lib. Eur. p. 60, pl. iii (1840); Selys, Mon. Lib. Eur. pp. 29, 32, 206, pl. iii, fig. 4 (1840); id., Rev. Odon. pp. 7, 381 (1850); Calvert, Proc. Acad. Philad. p. 152 (1898); Morton, Trans. Ent. Soc. Lond. p. 304 (1907); Ris, Cat. Coll. Selys, fasc. xi, pp. 247, 251-254 (1910) (for full list of references consult this last); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, pp. 150, 151 (1918); Schmidt, Die Tierwelt Mitt. Eur. Band iv, p. 52 (1929).

Libellula quadripunctata Fabricius, Spec. Ins. vol. i, p. 520 (1781); id., Ent. vol. ii, p. 375 (1793); Hagen, Stett. Ent. Zeit. vol. x, p. 172 (1849).

Libellula maculata Harris, Expos. Engl. Ins. pl. xlvi, fig. 2 (1782).

Libellula ferruginata Cirillo (1787) [ex Piroatta' Ann. Mus. Civ. Genova, vol. xiv, p. 443 (1879)].

Libellula ternaria Say, J. Acad. Phil. vol. viii, p. 21 (1839).

Leptetrum quadrimaculatum Kirby, Trans. Zool. Soc. Lond. vol. xii, p. 287 (1889); id. Cat. Odon. p. 27 (1890); Navas, Broteria, vol. v, p. 173 (1905); Rousseau, Ann. Biol. Lac. p. 38, fig. 25 (1909).

Male.—Abdomen 24-30 mm. Hind-wing 32-38 mm.

Head: labium bright orange, middle lobe and sides of lateral lobes broadly black; labrum black, with two variably-sized, oval, bright orange spots at base; face and frons pale greenish-yellow, the latter narrowly black at base above; vesicle and occiput olivaceous; eyes olivaceous, capped with brown during life. *Prothorax* black, anterior border of anterior lobe narrowly bright yellow; *thorax* coated thickly with greyish hair, olivaceous-brown, with a sinuous narrow black stripe on humeral suture and another more sinuous or zigzagged black stripe on postero-lateral suture. *Legs* black. *Wings* hyaline, with a small blackish spot on the distal side of node, another under the pterostigma variably present, and a very large triangular blackish-brown spot at base of hind-wing which occupies the cubital space, discoidal cell, hypertrigone, and space between origin of sectors of arc and a variable area of the anal triangle adjoining the membrane to rather more than half-way to tornus, this area reticulated by the bright yellow nervures. The area anterior to this latter spot bright amber-yellow, extending, in some, along the anterior border of wing and covering an equivalent area at base of fore-wing; all these spots of very variable extent. Pterostigma blackish-brown, covering 2 to 3 cells; membrane white; 2 or 3 rows of cells between *IRiii* and *Rspl*; 4 rows of cells in discoidal field; nodal index

13-14	13-12
13-12	11-12

; discoidal cell of fore-wing usually 2-celled but sometimes 3- or 4-celled. *Abdomen* with segments 1 to 5 olivaceous, remaining segments

black, with the ventral borders each side narrowly streaked with bright yellow and segment 6 with the black more or less restricted to apical and subdorsal areas. *Anal appendages* of the usual Libelluline shape but very long and attenuated, nearly three times the length of segment 10, and superiors double the length of inferior. *Genitalia* small and inconspicuous, coated and hidden with long golden hairs.

Female.—Abdomen 26–29 mm. Hind-wing 31–37 mm.

Coloured similarly to the male, differing only by the broader abdomen, which is reddish-brown on dorsum, changing to black on the terminal five segments, and with the lateral yellow stripes more conspicuous than in the male. *Anal appendages* black, similar to superiors of male; vulvar scales black, triangular, separated by a broad notch with strongly divergent sides; borders of segment 8 not dilated.

Distribution.—That of the genus. I have specimens from Yusimarg and Gulmarg, KASHMIR, and from Lhasa, Tibet, which do not differ from European examples more than the latter differ among themselves. Considerable variation is met with in the dark markings and their extent in the wings, and there is also variation in the yellow tinting of anterior borders of wings, which appears to be due to the age of individual specimens. Breeds chiefly in small ponds thickly overgrown with reeds, but is occasionally found along the borders of canals.

Examples of this insect are found in all collections; the *type* has been lost.

Genus **PALPOPLEURA** Rambur. (Fig. 94.)

Palpopleura Rambur, Ins. Névro. pp. 26, 129 (1842); Hagen, Stett. Ent. Zeit. vol. x, p. 170 (1849); Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, pp. 365, 716 (1868); Selys, Pollen, & Van Dam, Faune Madagas., Ins. p. 15 (1869); Kirby, Trans. Zool. Soc. Lond. vol. xii, pp. 257, 272, pl. lvi, fig. 6 (1889); id., Cat. Odon. pp. 9, 178 (1890); Karsch, Berlin Ent. Zeit. vol. xxxiii, p. 355 (1889); Förster, Jber. Mannheim, vols. lxxi, lxxii, p. 5 (sep.) (1906); Ris, Cat. Coll. Selys, fasc. xi, pp. 24, 316–318 (1910); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, pp. 488, 489 (1919).

Hemistigmoides Calvert, Proc. Acad. Philad. p. 239 (1899); Förster, Jber. Mannheim, vols. lxxi, lxxii, p. 6 (sep.) (1906).

Libelluline dragonflies of small size but robust build, coloured yellow with dark markings, abdomen pruinosed blue in adults and with wings more or less coloured and marked with black, brown, and yellow, the fore-wing with costal border near base, sinuously curved. Head of rather large size; eyes moderately contiguous; frons markedly angulated at crest and with shallow sulcus; vesicle large, notched. Prothorax

with rather large posterior lobe, quadrate and fringed with long hairs; thorax robust; legs slim, moderately long; hind femora with short, small, moderately closely-spaced spines and one or two longer ones at distal end; abdomen short, depressed, fusiform; wings rather short, moderately broad or narrow, often broadly and strikingly marked and coloured in both sexes; costal border in fore-wing with a sharp convexity involving the costal space at a point nearer base than node; discoidal triangles almost at the same level, that of fore-wing broad, traversed, often several times; that of hind-wing at the level of arc or but slightly distal, traversed, often several times; sectors of arc separated or but shortly fused in fore-wing, fused in the hind-wing; arc lying between the first and second antenodal nervures; $10\frac{1}{2}$ to $12\frac{1}{2}$ antenodal nervures, the last incomplete; usually only 1 cubital

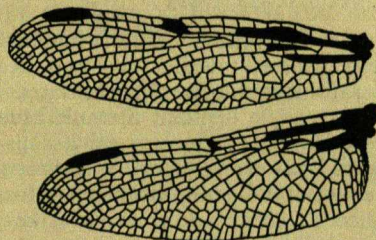


Fig. 94.—Wings of *Palpopleura sexmaculata sexmaculata* (Fabr.), male.

nervure in all wings; *Cu*ii arising from the posterior angle of discoidal cell in hind-wing; supplementary nervures often present in the bridge; 3 or 4 rows of cells in discoidal field of fore-wing, the field dilated at the wing-margin; 1 or 2 rows of cells between *IR*iii and *Rs*pl; anal loop very long, outer border angulated; pterostigma large; membrane rather short. Genitalia of male small, lobe prolonged; vulvar scales projecting, short and rounded; borders of segment 8 not dilated.

Genotype, *Palpopleura vestita* Rambur.

Distribution.—Africa in tropical zones, Madagascar, S. Asia, and China. Only one species and a single subspecies or race is found within our limits, this occurring in large colonies in marshy spots, usually in bamboo jungle, where they breed. Species of the genus are remarkable for their mimicry of hymenopterous insects, which they greatly resemble in their appearance and flight, the latter being low, circling, and unsustained.

472. *Palpopleura sexmaculata sexmaculata* (Fabricius). (Fig. 94.)

Libellula sexmaculata Fabricius, Mant. Ins. vol. i, p. 338 (1787); id., Ent. Syst. vol. ii, p. 381 (1793); Burmeister, Handb. Ent. vol. ii, p. 860 (1839); Rambur, Ins. Névropt. p. 126 (1842).

Æshna minuta Fabricius, Mant. Ins. 1, p. 339 (1787); id., Ent. Syst. 2, p. 385 (1793).

Palpopleura sexmaculata Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, p. 716 (1868); Kirby, Proc. Zool. Soc. Lond. p. 325 (1886); id., Trans. Zool. Soc. Lond. vol. xii, p. 273 (1889); id., Cat. Odon. p. 9 (1890); Selys, Ann. Mus. Civ. Genova, vol. xxx, p. 446 (1891); Calvert, Trans. Amer. Ent. Soc. vol. xxv, p. 92 (1898); Martin, Mission Pavie, p. 5 (sep.) (1904); Ris, Jena. Denkschr. vol. xiii, p. 331 (1908); id., Cat. Coll. Selys, fasc. xi, pp. 318, 325 (1910); id., ibid. fasc. xvi, p. 1114 (1913); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, p. 489 (1919); id., Rec. Ind. Mus. vol. xxvi, pp. 426, 433, 434 (1924); Lieftinck, Tijds. voor Ent. vol. lxx, p. 96 (1927); Fraser, Rec. Ind. Mus. vol. xxxiii, p. 446 (1931).

Male.—Abdomen 14–16 mm. Hind-wing 15–21 mm.

Head: labium yellow, middle lobe and occasionally the borders of lateral lobes black; labrum and face creamy-yellow; frons and vesicle brilliant metallic blue, this slightly overlapping crest of frons; occiput olivaceous-brown; eyes olivaceous, capped with brown above. *Prothorax* dark brown, with posterior collar and a geminate spot on dorsum of middle lobe bright yellow; *thorax* pale greenish-yellow, marked with dark brown and black as follows:—Dorsum warm reddish-brown, deepening on the antehumeral regions but paling to yellow along anterior border of humeral suture which is narrowly black; a black stripe bifurcating below, tapering away above soon after traversing spiracle; postero-lateral suture finely black. *Legs* bright yellow, flexor surface of tibiæ, tarsi, and outer sides of middle and anterior pairs of femora black. *Wings* hyaline marked with black; hind-wings usually tinted with yellow from base to proximal end of pterostigma, but this very variable, absent or very pale in specimens from the Annaimallais and Ceylon, more pronounced in Nilgiri specimens, in which it deepens at base and over a broad area between node and pterostigma: specimens from northern localities are usually deeper tinted than those from the south. A black spot at node in fore-wing covering from $\frac{1}{3}$ to $1\frac{1}{2}$ cells proximal to node; a black streak in subcostal space extending from base for two-thirds its length to node and overlapping costal space for a few cells near its middle, another streak between sectors of are occupying from 2 to 5 cells, a third stripe in cubital space extending from base nearly to or right up to discoidal cell. Similar streaks in the hind-wing, but the subcostal stripe not extending into costal space, the intersector stripe

absent. These stripes very variable in extent according to locality, very restricted in southern forms, as from the Annaimallai Hills, broader and often more or less confluent in northern forms. In Ceylon forms the cubital stripe extending into anterior half of discoidal cell and posteriorly into one cell-row of the anal area, whilst in the hind-wing it extends over whole of discoidal cell, the intersector streak also present. Pterostigma black in adults, with centre streaked with white, yellow in teneral, with borders broadly and distal third black, covering about 3 cells; membrane creamy-white; discoidal cell of fore-wing traversed once or twice, that of hind-wing once; only 1 row of cells between *IRiii* and *Rspl*; 2 or 3 cells

in subtrigone of fore-wing; nodal index $\frac{6-11}{5-7} \mid \frac{10-6}{8-5}$, the distal antenodal incomplete. *Abdomen* pruinosed light blue, sides of segments 1, 2, and base of 3 yellow; beneath yellow, with a median stripe of black. Subadults and teneral, coloured similar to female. *Anal appendages* black, of the usual Libelluline shape.

Female.—*Abdomen* 13–14 mm. *Hind-wing* 18–21 mm.

Differs from the male rather widely. Labium usually entirely yellow; labrum and face, including whole of frons, brighter yellow, the latter non-metallic. Markings of *prothorax* and *thorax* very restricted, the former entirely yellow save for base of anterior lobe, sides of posterior lobe, and a subdorsal spot on each side of middle lobe; dorsum of thorax rich ochreous with obsolete antehumeral brown stripe on each side, whilst laterally only a vestigial stripe of black present. *Wings* more broadly marked with blackish-brown and black and more deeply tinted with amber-yellow. Fore-wing with subcostal stripe confluent with intersector stripe by interposition of a third stripe; cubital space stripe extending into nearly whole of subtrigone, discoidal cell, and a variable area of anal area. Hind-wing more closely similar to male in dark markings, but amber tinting extending in some to extreme apex and very deep in all specimens towards the pterostigma; neurulation in dark areas golden-yellow; pterostigma black for distal half, creamy-yellow for proximal. *Abdomen* bright ochreous with ventral borders and sutures finely black and with a mid-dorsal stripe of black extending from segment 3 to end, narrow on segment 3 but gradually broadening analwards; in addition to these, a broad subdorsal black stripe on same segments which broadens towards apical end of each segment and terminates at *anal appendages*, which are black, and shortly conical. *Genitalia* as for genus.

Distribution.—From CEYLON and WESTERN INDIA to Tibet and throughout Malaysia and Indo-China to China. I have

specimens from Ceylon, Annaimallai, Shevaroy, and Nilgiri Hills, S. India; Coorg, Eastern Ghats, Assam, and Bengal. Great variations are found, but these crop up in all localities in a very irregular manner and, apart from the Sylhet race described below, no well-defined races are known. About 5 per cent. of the females from southern localities, and nearly all those from northern ones, show an additional opaque spot in the hind-wing just below the proximal end of pterostigma, this variable in size and shape. This spot is never found in the males save in the Sylhet race.

Specimens are found in most national collections, including the British and Indian Museums and the Pusa collection. The Fabricius *type* has been lost.

473. *Palpopleura sexmaculata octomaculata* Fraser.

Palpopleura sexmaculata octomaculata Fraser, J. Darjeeling Nat. Hist. Soc. vol. x, pp. 23-27 (1935).

Male.—Abdomen 12 mm. Hind-wing 14 mm.

Differs from *sexmaculata sexmaculata* by its smaller size, by the wings, especially the hind, being much narrower and of even width throughout, and coloured similarly in both sexes, those of the male being marked and coloured similar to those of the female of *sexmaculata sexmaculata*.

Dorsum of *thorax* reddish-brown, with the mid-dorsal carina and a narrow bordering to same yellow, humeral suture black above on the dorsal side, then continued very finely below. *Wings* with basal black markings more extensive than in the female of *sexmaculata sexmaculata*, this extending in fore-wing nearly to wing-border in some specimens and in the hind to as far as the tornal angle of base, including the basal portion of anal loop. Beneath the proximal half of pterostigma, in the male, a very large, triangular, opaque black spot extending transversely across the hind-wing for two-thirds of its breadth. Nodal spot in fore-wing covering 2 cells, and a vestige of this spot present in the hind-wing. Amber tinting of hind-wing very intense and extending almost up to extreme apex of wing. *Abdomen* pruinosed blue and with sides of segments 1 to 3 and base of 4 laterally yellow, a small yellow spot at the base laterally on segments 5 to 7 which may be extended in some as a narrow lateral stripe as far as apical end of segments; segment 8 with a subdorsal longitudinal spot on each side; segment 10 and bases of *anal appendages* yellow, but sides and extreme base of segment black.

Female unknown.

Distribution.—A number of males from Sylhet, ASSAM, characterized by their extremely small size and gynomorphic

colouring. They differ also from *sexmaculata sexmaculata* by the large preapical spot in the hind-wing and vestigial nodal spot present in the same wing. Some females of the latter species have the preapical spot, but it is quite unknown in the male.

Type in the Author's collection.

Genus **NANNOPHYA** Rambur. (Fig. 95.)

Nannophya Rambur, Ins. Névropt. pp. 26, 27 (1842); Hagen, Stett. Ent. Zeit. vol. x, p. 171 (1849); Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, pp. 369, 726 (1868); Karsch, Ent. Nachr. vol. xv, p. 256 (1889); Kirby, Cat. Odon. p. 45 (1890); Ris, Cat. Coll. Selys, fasc. xi, pp. 24, 345-347 (1910); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvii, pp. 495, 496 (1921).

Nannodythemis Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, pp. 369, 726 (1868); Kirby, Trans. Zool. Soc. Lond. vol. xii, pp. 258, 311 (1889); Karsch, Ent. Nachr. vol. xv, p. 260 (1889); Kirby, Cat. Odon. p. 44 (1890); Tillyard, Proc. Linn. Soc. N.S.W. vol. xxxiii, p. 444 (1908).

Fylla Kirby, Trans. Zool. Soc. Lond. vol. xii, pp. 259, 313 (1889).

Libelluline dragonflies of very small size and delicate build, comprising the smallest known species of the subfamily ;

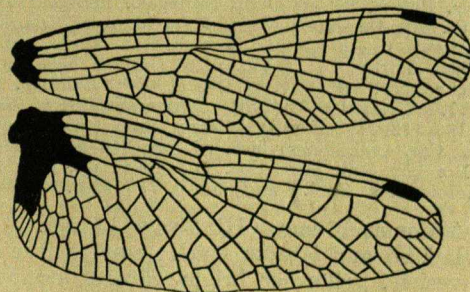


Fig. 95.—Wings of *Nannophya pygmaea* Rambur, male.

coloured brightly in the male, in which the abdomen is wholly or partly bright scarlet-red. Head relatively large; eyes shortly contiguous; frons without prominent crest but sulcus deep; vesicle high, rounded, or slightly notched. Prothorax with moderately large posterior lobe, fringed with long hairs; thorax narrow, small; legs long and slim; hind femora with evenly-sized, more or less closely-set spines and one or two longer distal ones. Abdomen short, depressed and fusiform; genitalia: lamina depressed, broadly arched; hamules very small, inner slim, acutely-pointed hooks, outer triangular foliate lobes; lobe longer than hamules, slightly



angulated, narrow, fringed with long hairs. Vulvar scales very long, extending nearly to end of segment 9; sides of segment 8 not dilated. Wings short, with broad anal field in hind-wing and moderately open reticulation; discoidal cells entire, that of fore-wing with its costal side more or less broken or angulated as in genus *Tetrathemis* and with adjacent subtrigone 1-celled, that of hind-wing at level of or slightly distal to level of arc; sectors of arc fused for a long distance; arc lying between the first and second antenodal nervures; *Cu₁* in both wings widely separated from posterior angle of discoidal cell; discoidal field in fore-wing beginning 1 cell wide and widely dilated at wing-border; only 5 or 6 antenodal nervures, the distal one complete; 1 cubital nervure in fore-wing, 1 or 2 in the hind; 1 row of cells between *IR₁* and *Rs₁*; no supplementary nervures to the bridge; anal loop usually absent; pterostigma short; membrane very small.

Genotype, *Nannophya pygmæa* Rambur.

474. *Nannophya pygmæa* Rambur. (Fig. 95.)

Nannophya pygmæa Rambur, Ins. Névropt. p. 27, pl. ii, fig. 1 (1842); Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, p. 726 (1868); Selys, Pollen, & Van Dam, Madagas., Ins. p. 18 (1869); id., Mitth. Mus. Dresden, p. 295 (1878); id., Ann. Mus. Civ. Genova, vol. xxvii, p. 460 (1889); Karsch, Ent. Nachr. vol. xv, p. 256 (1889); Kirby, Cat. Odon. p. 45 (1890); Karsch, Mitt. Mus. Senckenberg, vol. xxv, p. 230 (1900); Laidlaw, Proc. Zool. Soc. Lond. part 1, p. 72 (1902); Kruger, Stett. Ent. Zeit. vol. lxxiii, p. 185 (1902); Martin, Mission Pavie, p. 7 (sep.) (1904); Ris, Cat. Coll. Selys, fasc. xi, pp. 346-348 (1910); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvii, pp. 496, 497 (1921); Laidlaw, Proc. Zool. Soc. Lond. p. 74 (1920).

Male.—Abdomen 10 mm. Hind-wing 13 mm.

Head: labium and labrum black; rest of face and frons, including vesicle, yellow or bright orange; occiput reddish as well as eyes. *Prothorax* black; *thorax* bright yellow to bright red, the dorsum, except above, near antealar sinus, and the humeral region black; a rather broad black stripe on each side on mesipimeron and a small point on upper parts of humeral, postero-lateral sutures black. *Legs* black. *Wings* hyaline, bright golden-amber at bases to as far out as discoidal cell in fore-wing and a little beyond that level in the hind-wing; pterostigma black, covering half a cell; membrane obsolete; nodal index $\frac{4-5}{4-4} \bigg| \frac{5-4}{4-4}$; only 1 cubital nervure in all wings; discoidal cell of fore-wing strongly angulated at middle of its costal border; other details as for genus. *Abdomen* and *anal appendages* bright scarlet-red, the latter of typical Libelluline shape.



Female.—Abdomen 9–11 mm. Hind-wing 12.5–14 mm.

Differs rather widely from the male in colour and markings. Face and frons greenish-yellow. *Prothorax* with a geminate spot on dorsum of middle lobe and a large spot on each side bright yellow. *Thorax* bright greenish-yellow, marked with black as follows:—A narrow stripe on each side crossing the humeral suture obliquely and meeting its fellow across dorsum of thorax anteriorly slightly below antealar sinus; a second similar stripe traversing the mesepimeron obliquely and running up to join its fellow across the antealar sinus, running parallel with the anterior stripe and enclosing between them a yellow stripe of equal thickness; a narrow mid-dorsal stripe confluent below with the first stripe but not extending beyond it; a small elongate spot between the two black stripes above and an incomplete stripe on metepimeron; beneath black. *Wings* similar to male but basal marking confined usually to hind-wing and of less extent. *Abdomen* with segments 2 to 6 ringed with pale yellow at base, ferruginous or brownish thereafter; segments 7 to 10 black, but 8 sometimes reddish-brown at base. *Anal appendages* black.

Distribution.—Within our limits found only in LOWER BURMA; I possess 6 males and 3 females from King Island, Mergui, Lower Burma, and others of the same series are in the Pusa collection. I have also 3 females from Siam which differ only by their paler colour at base of wings. This species extends to Borneo, Celebes, and Sumatra, through Malaysia and Indo-China. There is no difficulty in distinguishing it from all other Libellulines by its very diminutive size; it is in fact the smallest known member of the family Libellulidæ. In flight, like *P. sexmaculata*, it resembles a hymenopterous insect, especially the yellow striped females, the resemblance being heightened by the low short and circling flight.

The type is in the Selys collection, Brussels Museum.

Genus **BRACHYDIPLAX** Brauer. (Fig. 96.)

Brachydiplax Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, pp. 172, 368, 725 (1868); Kirby, Trans. Zool. Soc. Lond. vol. xii, pp. 263, 280 (1889); id., Cat. Odon. p. 22 (1890); Ris, Cat. Coll. Selys, fascs. ix & xi, pp. 25, 358–360 (1909–1910); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, p. 490 (1919).

Microthemis Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, pp. 367, 724 (1868); Kirby, Trans. Zool. Soc. Lond. vol. xii, pp. 263, 279, pl. lvi, fig. 1 (1889); id., Cat. Odon. p. 22 (1890).

Head rather small; eyes contiguous for a long distance; frons prominent but rounded at crest; vesicle low, rounded.

Prothorax with a moderate to large posterior lobe, which is rectangular, more or less emarginate, and fringed with long hairs; thorax robust; legs long, slim; hind femora with rows of closely-set, rather numerous, evenly-sized spines. Abdomen rather short, broad at base, then tapered gradually to the end; segment 4 without a jugal suture; genitalia with short, curled hamules and scale-like base, lobe very narrow. Female with borders of segment 8 not dilated; vulvar scales broad, projecting, and prolonged backwards. Wings long, rather narrow, reticulation moderately open; discoidal cell in fore-wing moderately narrow, its costal side about half the length of distal and basal, entire; sub-trigone in fore-wing made up of 3 cells; all hypertrigones and discoidal cell of hind-wing entire, the latter with its base

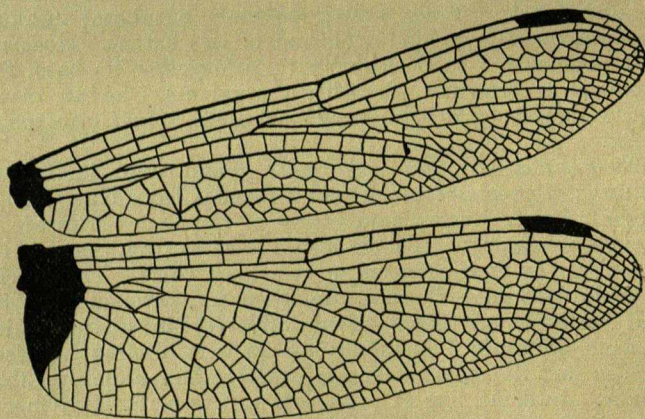


Fig. 96.—Wings of *Brachydiplax chalybea* Brauer, male.

at or slightly distal to level of arc; arc lying between the first and second antenodal nervures: sectors of arc shortly fused in fore-wing, with a long fusion in the hind; 1 cubital nervure in all wings; *Cuii* arising from posterior angle of discoidal cell in hind-wing; 1 row of cells between *IRii* and *Rspl*; 2 rows of cells in discoidal field, which latter is dilated at wing-border; 6 to 9 antenodal nervures, the distal one complete; anal loop with dilated end and strongly angulated distal side; pterostigma moderately long or short; membrane rather large.

Genotype, *Libellula sobrina* Rambur.

Distribution.—S. Asia, Sumatra, Borneo, Celebes, Papua, and Australia. Three species are known from within our limits, one of which is indigenous. Species of the genus



breed in small weedy tanks and ponds and rarely wander far from such habitats. Subadult males and fully adult females have a habit of perching on twigs in scrub-jungle in the immediate neighbourhood of the larval habitats; at Fraserpet, Coorg, I have seen scores occupying such situations, nearly every twig having its occupant. The adult male, with the abdomen pruinosed conspicuously blue, hawks amongst the rank vegetation of the waterside, but is quick on the wing and rarely comes within striking distance.

Key to Indian Species of Brachydiplax.

- | | | | |
|----|---|--|----------|
| 1. | { | Dorsum of thorax densely pruinosed; sides of thorax and basal segments of abdomen ferruginous; bases of all wings burnt-brown or golden-brown | [p. 328. |
| | | <i>chalybea</i> Brauer, | |
| 2. | { | Dorsum of thorax thinly or not pruinosed; sides of thorax dark metallic or yellow marked with black; bases of wings uncoloured or but very palely so | [p. 327. |
| | | <i>farinosa</i> Kruger, | |
| 2. | { | 8 to 9 antenodal nervures in fore-wing; male sexual organs barely visible in profile | [p. 325. |
| | | <i>sobrina</i> (Rambur), | |

475. *Brachydiplax sobrina* (Rambur).

Libellula sobrina Rambur, Ins. Névro. p. 114 (1842).

Diplax sobrina Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, p. 721 (1868).

Sympetrum (?) *sobrinum* Kirby, Cat. Odon. p. 17 (1890).

Brachydiplax gestroi Selys, Ann. Mus. Civ. Genova, vol. xxx, p. 451 (1891).

Brachydiplax sobrina Kirby, J. Linn. Soc., Zool. vol. xxiv, p. 551 (1893); Ris, Cat. Coll. Selys, fasc. xi, pp. 359-361 (1910). id., ibid. fasc. xvi, p. 1122 (1916); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, pp. 490, 492 (1919); id., Rec. Ind. Mus. vol. xxvi, pp. 426, 434 (1924); id., J. Siam. Soc., Nat. Hist. Suppl. vol. vii, p. 84 (1927); id., Rec. Ind. Mus. vol. xxxiii, p. 446 (1931).

Brachydiplax indica Kirby, Trans. Zool. Soc. Lond. vol. xii, p. 329, pl. liv, fig. 9 (1889); id., Cat. Odon. p. 22 (1890); Martin, Mission Pavie, p. 5 (sep.) (1904).

Male.—Abdomen 20-24 mm. Hind-wing 25-28 mm.

Head: labium yellow to pale brown, middle of mid-lobe and borders of lateral lobes very narrowly black; labrum bright yellow bordered with black, which broadens to a point at middle of lip; face and frons creamy-white; frons above metallic blue, this slightly overlapping the crest; vesicle metallic blue; occiput dark brown with a bright yellow geminate spot behind. *Prothorax* dark brown; *thorax* olivaceous-brown to greenish-yellow, with black or metallic



nervures, covering $1\frac{1}{2}$ cells; nodal index

Female.—Abdomen 16–22 mm. Hind-wing 22–26 mm.

Distribution.—Common all along the WEST COAST of India from BOMBAY to TRAVANCORE and CEYLON. I have specimens from Malabar, Coorg, Bengal, Assam, and Burma. At Fraserpet, Coorg, I saw it swarming in hundreds on and about a lotus tank. Teneral males and females were found on all trees within a hundred yards of the tank, whilst adult males were flying over the water, settling on lotus-leaves or low vegetation just out of reach of my net. It is a very shy insect and exceedingly quick on the wing, so that adults are not readily caught, even when present in numbers. It is a common insect on the Hebbal Tank, Bangalore. The readiest means for determining this species is the genitalia.



which are so large and prominent that the details can be seen with the naked eye.

Type in the Paris Museum, a female without indication of its locality, but probably from Bombay.

476. *Brachydiplax farinosa* Kruger.

Brachydiplax sobrina Selys, Ann. Mus. Civ. Genova, vol. xxx, p. 449 (1891).

Brachydiplax farinosa Kruger, Stett. Ent. Zeit. vol. lxiii, p. 135 (1902); Ris, Cat. Coll. Selys, fasc. xi, pp. 359, 361, 362 (1910); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, pp. 490, 492 (1919); id., J. Siam. Soc., Nat. Hist. Suppl. vol. vii, p. 84 (1927).

Brachydiplax pruinosa Laidlaw, Proc. Zool. Soc. Lond. part 1, p. 67 (1902).

Male.—Abdomen 18–19 mm. Hind-wing 22–25 mm.

Closely similar to the male of *B. sobrina* but a darker coloured insect, and the nodal index slightly higher. Labium often with whole of middle lobe and borders of lateral lobes broadly black; anterior surface of frons margined with black; occiput black. Whole of *prothorax* and *thorax* dark metallic green, dorsum in old adults powdered with white pruinescence.

Nodal index $\frac{6-8}{7-7} \mid \frac{8-6}{7-7}$. *Abdomen* black, pruinosed white in old adults. *Genitalia* entirely different: lamina depressed, broadly and shallowly concave; hamules broader at base, hooks more robust and less curled; lamina much longer and narrower, slightly expanded at apex.

Female.—Abdomen 17–18 mm. Hind-wing 22–26 mm.

Differs from the female of *sobrina* in the same respects as does the male. Adults have the *thorax* entirely dark metallic green and the abdomen black without markings and without pruinescence. *Wings* in both sexes palely tinted with yellow at bases, especially the hind; venational details similar to those of *sobrina*. Vulvar scales similar to those of the latter insect, but the notch quadrate and the corners slightly produced.

Distribution.—BENGAL, ASSAM, BURMA, Malaysia, and Sumatra. I have specimens from Cachar, Assam; King Island, Mergui, Lower Burma; Gokteik, Upper Burma; and Jalpaiguri District, Bengal. I have also received specimens from Siam. This species is easily distinguished from *B. sobrina* by its inconspicuous genitalia and by the general black metallic colour of the thorax.

Kruger's *type* comes from Sumatra and is in the Stettin Museum. Laidlaw's name was published one month after that of Kruger, so that the latter has priority.

477. *Brachydiplax chalybea* Brauer. (Fig. 96.)

- Brachydiplax chalybea* Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, pp. 173, 725 (1868); Selys, Mitt. Mus. Dresden, p. 303 (1878); id., Ann. Mus. Civ. Genova, vol. xxvii, p. 456 (1889); Kirby, Cat. Odon. p. 22 (1890); Kruger, Stett. Ent. Zeit. vol. lxxiii, p. 133 (1902); Ris, Cat. Coll. Selys, fasc. xi, pp. 359, 361, 362, figs. 213, 314 (1910); id., ibid. fasc. xvi, pp. 1122, 1123 (1916); Fraser, J. Siam. Soc., Nat. Hist. Suppl. vol. vii, p. 84 (1927); Lieftinck, Treubia, vol. xiv, livr. 4, p. 412 (1934).
Brachydiplax maria Selys, Mitt. Mus. Dresden, pp. 294, 303 (1878); Kirby, Cat. Odon. p. 22 (1890); Laidlaw, Proc. Zool. Soc. Lond. part 1, p. 67 (1902).
Brachydiplax chalybea Selys, An. Soc. Españ. Hist. Nat. vol. xi, p. 9 (sep.) (1882); Martin, Mission Pavie, p. 5 (sep.) (1904).
Brachydiplax gestroi Fraser, J. Bombay Nat. Hist. Soc. vol. xxvii, pp. 494, 495 (1921).

Male.—Abdomen 21–25 mm. Hind-wing 26–30 mm.

Head: labium palest ochre, mid-line of middle lobe and borders of lateral very finely black; labrum, face, and anterior surface of frons palest ochre; frons above and vesicle metallic blue; occiput black, with a geminate spot behind yellow. *Prothorax* brown; *thorax* ochreous or ferruginous laterally, pruinosed white on dorsum, and with vestiges of lines on upper parts of humeral and postero-lateral sutures metallic black. *Legs* black, coxæ and trochanters ferruginous. *Wings* hyaline, bases of all tinted burnt-brown, fading to amber at level of second antenodal and extending nearly to tornus in hind-

wing; nodal index $\frac{6-7}{6-6} \mid \frac{7-6}{6-6}$; other details similar to preceding species; pterostigma yellow between thick black nervures, covering rather more than 1 cell; membrane very narrow, yellowish. *Abdomen* black on dorsum, pruinosed nearly white; segments 1 to 3 ferruginous on dorsum and laterally, sutures finely black, pruinescence extending on to dorsum of segment 3 and base of 2. *Anal appendages* black, of the usual Libelluline shape. *Genitalia* very similar to that of *B. farinosa*, but the hamules smaller and more slim, the lobe shorter.

Female.—Abdomen 21–23 mm. Hind-wing 27–29 mm.

Resembles the subadult male. Thorax ochreous, with similar lateral markings and an obscure antehumeral stripe which curves in above to meet its fellow at the mid-dorsal carina. *Wings* only palely tinted with yellow at base. *Abdomen* ochreous with sutures and intersegmental joints finely black; 5 to 10 marked with black dorsally except at the base of segments 5 and 6, apical half of segment 7, the whole of 8 save its extreme base, and the whole of 9 and 10. *Anal appendages* black, shortly conical; vulvar scales half the length of segment 9, very broad, and cleft into two lobes by a deep fissure.

Distribution.—Extends from ASSAM, through BURMA and Malaysia, to Borneo and the Celebes and Sumatra. Mr. Bainbrigge Fletcher found this species common on the banks of the Brahmaputra and sent me specimens from Gauhati, Assam. I have also examples from Bangkok, Siam, where it appears to be common. Lieftinck states that it swarms in parts of Java, and its habits, as described by him, are entirely similar to those of *B. sobrina* as observed by myself. This species is easily distinguished by its larger size and by the characteristic colouring of the thorax and bases of wings.

The *type* is in the Selys collection, Brussels Museum.

Genus **ACISOMA** Rambur. (Fig. 97.)

Acisoma Rambur, Ins. Névro. pp. 26, 28 (1842); Hagen, Stett. Ent. Zeit. vol. x, p. 171 (1849); Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, pp. 367, 724 (1868); Kirby, Trans. Zool. Soc. Lond. vol. xii, pp. 263, 309 (1889); Karsch, Berlin Ent. Zeit. vol. xxxiii, p. 357 (1890); Förster, Jber. Mannheim, vols. lxxi, lxxii, p. 9 (sep.) (1906); Ris, Cat. Coll. Selys, fascs. ix, xi, pp. 28, 455, 456 (1909–1910); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, pp. 492, 493 (1919).

Libelluline dragonflies of small size, coloured blue marked with black and characterized by the peculiar shape of the

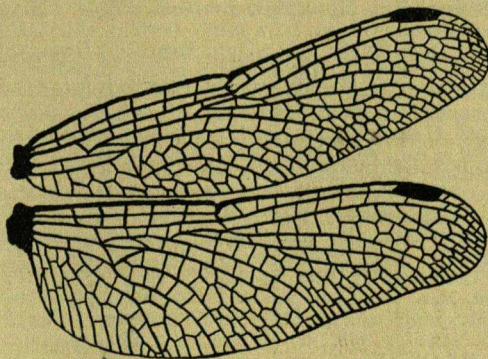


Fig. 97.—Wings of *Acisoma panorpoides panorpoides* Rambur, male.

abdomen. Head relatively small; eyes only just meeting; frons rounded and with shallow sulcus; vesicle low, rounded. Prothorax with large posterior lobe, slightly emarginate, fringed with long hairs; thorax narrow, small; legs moderately long, slim, hind femora with rows of closely-set, evenly-sized, short spines on the proximal half, then somewhat longer and more robust spines on distal half; abdomen from

segments 1 to 5 laterally and dorso-ventrally widely dilated, then abruptly slimmed and cylindrical from segments 6 to 10. genitalia of male small and inconspicuous, lobe small, narrow and rectangular. Vulvar scales prolonged, oval, projecting obliquely. Wings short, moderately broad, reticulation rather open; discoidal cell in fore-wing entire, its costal side often angulated distally and less than half the length of distal and basal sides; discoidal cell in hind-wing with base at level of arc, entire; sectors of arc fused for a long distance; arc situated between the first and second antenodal nervures; 7 to 9 antenodal nervures, the distal complete or incomplete; 1 cubital nervure in all wings; *Cu*ii in hind-wing widely separated from the posterior angle of discoidal cell; discoidal field beginning with 2 rows of cells, its border widely divergent at wing-border; no supplementary nervures to bridge; subtrigone in fore-wing with 3 cells; 1 row of cells between *IR*iii and *Rs*pl; anal loop dilated distally and with distal border strongly angulated; pterostigma relatively large; membrane small.

Genotype, *Acisoma panorpoides* Rambur.

478. *Acisoma panorpoides panorpoides* Rambur. (Fig. 97.)

Acisoma panorpoides Rambur, Ins. Névro-p. p. 28, pl. ii, fig. 2 b (1842); Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, p. 724 (1868); Selys, Mitt. Mus. Dresden, p. 294 (1878); id., An. Soc. Españ. vol. xi, p. 8 (sep.) (1882); id., C. R. Soc. Ent. Belg. (sep.) (1888); id., Ann. Mus. Civ. Genova, vol. xxvii, p. 455 (1889); Kirby, Trans. Zool. Soc. Lond. vol. xii, p. 309 (1889); id., Cat. Odon. p. 43 (1890); Selys, Ann. Mus. Civ. Genova, vol. xxx, p. 448 (1891); Karsch, Ent. Nachr. vol. xvii, p. 46 (1891); Kirby, J. Linn. Soc., Zool. vol. xxiv, p. 556 (1891); id., Ann. Mag. Nat. Hist. (7) vol. v, p. 534 (1900); Laidlaw, Proc. Zool. Soc. Lond. part 1, p. 70 (1902); Kruger, Stett. Ent. Zeit. vol. lxiii, p. 128 (1902); Martin, Mission Pavie, p. 7 (sep.) (1904); Kirby, Ann. Mag. Nat. Hist. (7) vol. xv, p. 271 (1905); Morton, Trans. Ent. Soc. Lond. p. 305 (1907); Ris, Cat. Coll. Selys, fasc. xii, pp. 456-458 (1911); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, p. 493 (1919); id., Rec. Ind. Mus. vol. xxvi, pp. 426, 434 (1924); Laidlaw, J. F.M.S. Mus. vol. xvi, p. 224 (1930); Fraser, Rec. Ind. Mus. vol. xxxiii, p. 446 (1931); Lieftinck, Treubia, vol. xiv, livr. 4, p. 413 (1934).

Male.—Abdomen 15-18 mm. Hind-wing 16-21 mm.

Head: labium creamy-white; labrum pale yellow; face and frons palest azure-blue, the latter bordered with black at base; vesicle and occiput black, the latter with a geminate yellow spot behind; eyes blue during life, behind glossy black spotted with yellow. *Prothorax* black, with the anterior border of anterior lobe, mid-dorsum of middle lobe, and posterior border and mid-dorsum of posterior lobe pale yellow. *Thorax* azure-blue marbled with black, which colour forms an intricate pattern of hieroglyphics on dorsum and sides;



sutures all narrowly black. *Legs* black, femora striped with yellow. *Wings* hyaline; nodal index

6-7	7-6	7-7	7-8
6-6	6-6	6-6	6-7

; distal antenodal complete; discoidal field with 2 rows of cells, but occasionally beginning with 2 cells and then continued as a single row; costal side of discoidal cell in fore-wing nearly always angulated; pterostigma pale yellow between black nervures, covering rather more than 1 cell; membrane brownish. *Abdomen* azure-blue, marked with black as follows:—Segments 1 to 5 with sutures finely and ventral borders more broadly black, a dorsal stripe which broadens at the jugal sutures and apical borders of segments so as to have a deeply serrate edge, a speckled stripe on subdorsum of segments 1 to 4, interrupted irregularly, and lastly, a large ventro-lateral spot on each of segments 3 to 5 extending from apical border and terminating in three points *en echelon*; segments 6 and 7 black with a large spot of the ground-colour on each side not quite extending to apical end of segment on 7; segments 8 to 10 entirely black. *Anal appendages*: superiors very long, nearly straight, acute at apex and spined beneath nearly to base, white or yellow above, black beneath; inferior very broadly triangular, white at middle, bordered with black.

Female.—Abdomen 15–18 mm. Hind-wing 17–22 mm.

Entirely similar to the male in colour, markings, and shape of abdomen; differs only in sexual characters, which are as for genus.

Distribution.—Widely distributed from WESTERN INDIA and CEYLON to the Philippines and China, extending southwards to Java, Sumatra, and the Celebes. The species has a very weak and short flight and keeps closely to rank herbage and reeds in the heavily weeded tanks and lakes in which it breeds. I have never found it away from water; its broken and cryptic colour-pattern render it rather inconspicuous as it dodges its way through the rank herbage. The characteristic shape of the abdomen will serve to distinguish this species from other Indian Libellulines.

Specimens are found in all national collections; the *type* appears to have been lost.

Genus **DIPLACODES** Kirby. (Fig. 98.)

Diplacodes Kirby, Trans. Zool. Soc. Lond. vol. xii, pp. 263, 307 (1889); id., Cat. Odon. pp. 42, 183 (1890); Karsch, Berlin Ent. Zeit. vol. xxxiii, pp. 357, 372 (1890); Förster, Jber. Mannheim, vols. lxx, lxxi, p. 10 (sep.) (1906); Ris, Cat. Coll. Selys, fascs. ix, xii, pp. 28, 461–463 (1909–10); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, pp. 500, 501 (1919).

Dragonflies of rather small size, coloured greenish-yellow, marked with black in the subadult stage, or black with or

without pruinescence in the adult stage, and with wings hyaline or partly enfumed or marked with black. Head moderately large; eyes contiguous for but a short distance; frons without sharply defined crest but moderately prominent and with deep sulcus; vesicle rounded. Prothorax with moderately large to large posterior lobe, fringed with long hairs; thorax rather narrow; legs rather slim, hind femora with a row of rather widely spaced, gradually lengthening spines. Wings relatively short and broad, reticulation moderately close; discoidal cell in fore-wing narrow, costal border not angulated, less than half the length of basal or distal sides, entire or traversed; discoidal cell of hind-wing with base at the level of arc, entire; sectors of arc shortly fused in fore-wing, with a long fusion in the hind; arc situated between the first and second antenodal nervures; $6\frac{1}{2}$ to

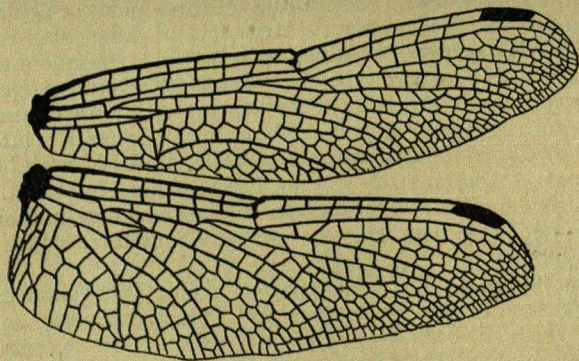


Fig. 98.—Wings of *Diplacodes trivialis* (Rambur), male.

$9\frac{1}{2}$ antenodal nervures, the distal one incomplete; 1 cubital nervure in all wings; *Cuii* in hind-wing widely separated from posterior angle of discoidal cell; discoidal field beginning with 2 or 3 rows of cells and then continued as rows of 2 cells, with sides diverging at wing-border; no supplementary nervures to the bridge; subtrigone in fore-wing 1- to 3-celled; 1 row of cells between *IRiii* and *Rspl*; anal loop dilated at end, its distal side strongly angulated; pterostigma moderately long, or rather short and slightly dilated; membrane narrow. Abdomen slightly dilated at base, then slim and triquetral to the end; cylindrical in the female. Genitalia: lamina strongly and evenly arched or projecting markedly hood-like; hamules with narrow oval base and short, strongly-curved hooks; lobe variable, clubbed or tongue-shaped. Female with borders of segment 8 not dilated; vulvar scales prolonged, prominent in profile, very broad.

Genotype, *Libellula lefevrei* (Rambur).



Distribution.—Old World only, in tropical zones, but extending to Oceania. Three species found within our limits, one of which is Ethiopian in origin. All breed in swampy areas or in lakes bordered with rank vegetation; some remain in the vicinity of their watery habitat, whilst others roam far and wide and engage in migratory flights.

Key to Indian Species of Diplacodes.

- | | | | |
|------|---|------------------------------|-----------|
| 1. { | Apices of wings tipped with black | <i>nebulosa</i> (Fabricius), | |
| | Apices of wings hyaline | 2. | [p. 335.] |
| | Adults entirely black, without markings ; | | |
| | wings palely enfumed with brown towards | | [p. 333.] |
| | apices ; anal appendages black | <i>lefebvrei</i> (Rambur), | |
| 2. { | Adults black marked with yellow or | | |
| | pruinosed dark blue throughout ; wings | | |
| | uncoloured except at base ; anal appen- | | [p. 336.] |
| | pendages yellow | <i>trivialis</i> (Rambur), | |

479. *Diplacodes lefebvrei* (Rambur).

- Libellula lefebvrei* Rambur, Ins. Névro. p. 112 (1842).
Libellula parvula Rambur, Ins. Névro. p. 116 (1842); Selys, Revue Odon. p. 314 (1850); id., Maillard, Réunion, 2 K, p. 34 (1862); id., Pollen & Van Dam, Madagas., Ins. p. 23 (1869).
Libellula flavistyla Rambur, Ins. Névro. p. 117 (1842); Selys, Lucas, Algérie, p. 124, pl. i, fig. 7 (1849); id., Rev. Odon. p. 312 (1850); Hagen, Peters' Reise Mossambique, Zool. 5, p. 105 (1862); Selys, Pollen & Van Dam, Madagas., Ins. p. 23 (1869); id., Ann. Soc. Ent. Belg. xiv, p. 13 (1870); Gerstaecker, Jahr. Hamburg. wiss. Anst. vol. ix, p. 5 (sep.) (1891).
Libellula tetra Rambur, Ins. Névro. p. 119 (1842); Selys, Maillard, Réunion, 2 K, p. 34 (1862); id., Pollen & Van Dam, Madagas., Ins. p. 23 (1869).
Libellula concinna Rambur, Ins. Névro. p. 120 (1842).
Libellula morio Schneid., Stett. Ent. Zeit. vol. vi, p. 112 (1845).
Diplacina flavistyla Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, p. 733 (1868); Selys, Ann. Soc. Ent. Belg. vol. xxxi, pp. 22, 67 (1887); MacLachlan, Ent. Month. Mag. (1) vol. xxv, p. 348 (1889).
Diplacina tetra Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, p. 733 (1868).
Diplacodes tetra Kirby, Trans. Zool. Soc. Lond. vol. xii, p. 308 (1889); id., Cat. Odon. p. 42 (1890); Förster, Jahr. Nassau, vol. lix, p. 308 (1906).
Diplacodes ramburi Kirby, Cat. Odon. p. 42 (1890).
Diplacodes lefebvrei Kirby, Cat. Odon. p. 42 (1890); Calvert, Proc. U.S. Nat. Mus. vol. xviii, p. 144 (1895); Kirby, Ann. Mag. Nat. Hist. (7) vol. ii, p. 239 (1898); Karsch, Ent. Nach. vol. xxiv, p. 343 (1898); Grunberg, Zool. Jahrb. Syst. vol. xviii, p. 719 (1903); Martin, Mem. R. S. Españ. Hist. Nat. 1, vol. xxiii, p. 424 (1907); id., Ann. Mus. Civ. Genova, vol. xliii, pp. 655, 661 (1908); Ris, Jena. Denck. vol. xiii, p. 333 (1908); Sjöstedt, Kilimandjaro, pp. 4, 22 (1909); Ris, Cat. Coll. Selys, fasc. xi, pp. 462, 465-468 (1910); id., ibid. fasc. xvi, p. 1153 (1916); Fraser, Rec. Ind. Mus. vol. xxvi, pp. 426, 435 (1924); id., ibid. vol. xxxiii, p. 446 (1931).

Diplacodes parvula Needham, Proc. U.S. Nat. Mus. vol. xxvi, pl. xlv, fig. 2 (1903).

Diplacodes flavistyla MacLachlan, Nat. Hist. Sokotra, p. 401 (1903).

Diplacodes tetra unimaculata Förster, Jahr. Nassau, vol. lix, p. 307 (1906).

Male.—Abdomen 17–25 mm. Hind-wing 21–29 mm.

Head: labium, labrum, face, and frons black, the latter with a dark violaceous reflex above; vesicle and occiput black; eyes dark brown above, violaceous below. *Prothorax*, *thorax*, *abdomen*, and *legs* entirely black in full adults, but in subadults obscurely yellow on sides of thorax, clouded with warm brown and with darker lines on the sutures; abdomen with sides of segments 1 to 3 and paired subdorsal elongate spots on segments 4 to 8 yellow. *Wings* hyaline, clouded with blackish-brown from node to apex, this pale and gradually deepening towards pterostigma; nodal index

$$\frac{6-7\frac{1}{2}}{6-6} \bigg| \frac{7\frac{1}{2}-6}{6-6};$$

rarely specimens are met with with $6\frac{1}{2}$ or $8\frac{1}{2}$ antenodal nervures in fore-wing; subtrigone in fore-wing 1- or 2-celled; pterostigma brown above, white beneath, between thick black nervures; membrane black; base of hind-wing with a blackish-brown marking extending the length of membrane and to just distal of the cubital nervure. *Anal appendages* black or yellow, with base black in subadults. *Genitalia*: lamina depressed, strongly arched; hamules with broad conical base overlapping the lobe and with small, very strongly curved hooks directed inwards; lobe club-shaped, large.

Female.—Abdomen 14–18 mm. Hind-wing 18–23 mm.

Adult females similar to adult males, but usually some pale markings on face. Subadults coloured yellow with black markings and abdomen black with yellow markings. Labium, labrum, and face dirty white, frons clouded with blackish-brown above; vesicle and occiput brown. *Prothorax* and *thorax* bright citron-yellow, with black markings more or less obscuring the ground-colour, a broad stripe on mid-dorsum trifold above, the outer arm confluent with a “y”-shaped mark which crosses the humeral region obliquely, the tail of the “y” curling back and upwards on to mesepimeron, an incomplete stripe just behind this and the postero-lateral suture finely black. Legs with bases of femora and extensor surface of tibiæ bright yellow. *Wings* more palely enfumed than in the male and the basal black marking replaced by a smaller area of rich amber-yellow; nodal index similar or lower; other venational details as for male. Vulvar scales as for genus; segment 8 not dilated laterally.

Distribution.—This species, which was regarded as a purely African one up to within recent years, has been found quite



common in Mesopotamia and along the WEST COAST of INDIA. I found it in great numbers at Fraserpet, Coorg. Coorg specimens rapidly attain complete melanism, in strong contrast to the paler desert forms from Mesopotamia. This species is apt to be confused with *D. nebulosa*, but the diffuse dark clouding of the apical portion of the wing is quite different to the well-defined black apex found in *nebulosa*, and the latter has not the blackish-brown spot at base of hind-wing which is so conspicuous in *lefebvrei*; the colour of the pterostigma is an additional aid to identification. This species is found on open waste lands, settling on the ground, especially on footpaths, and may be found at long distances from water.

The *type* is in the Selys collection, Brussels Museum; specimens in most national collections.

480. *Diplacodes nebulosa* (Fabricius).

- Libellula nebulosa* Fabricius, Ent. Syst. vol. ii, p. 379 (1793); Hagen, Verh. zool.-bot. Ges. Wien, vol. viii, p. 481 (1858).
Diplax nebulosa Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, p. 721 (1868); Selys, Ann. Soc. Ent. Belg. vol. xxvii, p. 96 (1883); id., ibid. vol. xxviii, p. 32 (1884).
Diplacodes nebulosa Kirby, Trans. Zool. Soc. Lond. vol. xii, p. 308 (1889); Karsch, Berlin Ent. Zeit. vol. xxxiii, p. 372 (1890); Kirby, Cat. Odon. p. 42 (1890); Selys, Ann. Mus. Civ. Genova, vol. xxx, p. 468 (1891); Kirby, J. Linn. Soc., Zool. vol. xxiv, p. 556 (1893); id., Ann. Mag. Nat. Hist. (7) vol. v, p. 534 (1900); Laidlaw, Proc. Zool. Soc. Lond. part 2, p. 70 (1902); Martin, Mission Pavie, p. 7 (sep.) (1904); Tillyard, Proc. Linn. Soc. N.S.W. vol. xxxi, p. 485 (1906); Morton, Trans. Ent. Soc. Lond. p. 305 (1907); Ris, Cat. Coll. Selys, fasc. xii, pp. 462-464, fig. 291 (1911); id., ibid. fasc. xvi, p. 1152 (1916); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, pp. 501, 502 (1919); id., Rec. Ind. Mus. vol. xxvi, pp. 426, 434, 435 (1924); Laidlaw, J. F.M.S. Mus. vol. xvi, p. 224 (1830); Fraser, Rec. Ind. Mus. vol. xxxiii, p. 446 (1931); Liefstinck, Treubia, vol. xiv, livr. 4, p. 413 (1934).

Male.—Abdomen 15-17 mm. Hind-wing 17-19 mm.

Head: labium blackish-brown; labrum and face brown, occasionally marked with a yellow spot on each side of postclypeus and also on base of mandibles; frons and vesicle and upper surface of eyes dark violet, with metallic lustre on the two former. *Prothorax, thorax, abdomen, and legs* entirely black, thinly pruinose in old adults. Subadults and tenerals with yellow markings on sides of thorax and abdomen similar to those of female. *Wings* with all apices blackish-brown as far inwards as proximal end of pterostigma, this dark area very sharply defined from the rest of wing; pterostigma dark reddish-brown between thick black nervures; membrane cinereous; nodal index

$5-7\frac{1}{2}$	$7\frac{1}{2}-6$	$5-7\frac{1}{2}$	$7\frac{1}{2}-5$
$6-5$	$5-6$	$5-5$	$5-5$

subtrigone in fore-wing 1- or 2-celled; other details similar to those of *lefebvrei*. *Genitalia* closely similar to *lefebvrei*.

Female.—Abdomen 14–15 mm. Hind-wing 18 mm.

Labium, labrum, face, frons, and vesicle creamy-yellow without dark markings; eyes reddish-brown; occiput bright ochreous. *Prothorax*, *thorax*, and *abdomen* marked and coloured similarly to *D. lefebvrei*. *Legs* black, bases of femora and extensor surface of tibiæ yellow. *Wings* hyaline, hind-wing with but a trace of amber-yellow near membrane; venational details similar to male. *Genitalia* similar to that of *lefebvrei*.

Distribution.—Extends from WESTERN INDIA and CEYLON to Australia, and southwards to Java. Colonies of this species crop up in widely separated localities but, apart from such, it is a comparatively rare insect. It is closely related to *D. lefebvrei*, and teneral forms can hardly be distinguished from one another, although the differences become increasingly broad as adult age is reached. The males are distinguished by the sharply limited dark area at the apices of wings in the cases of *nebulosa*, contrasted with the pale diffuse enfumation in *lefebvrei*, the females by the creamy-white face and frons quite unmarked with black or brown, even in the case of adults. The distribution of *nebulosa* begins on the West Coast of India just where that of *lefebvrei* ends. Unlike the latter, it is never found away from water; marshes and heavily weeded tanks being favoured habitats.

Specimens are found in most national collections; I have numbers from Mergui, Lower Burma; Guindy, near Madras; Fraserpet, Coorg, and Mysore.

The *type* appears to have been lost.

481. *Diplacodes trivialis* (Rambur). (Fig. 98.)

Libellula trivialis Rambur, Ins. Névro. p. 115 (1842); Hagen, Verh. zool.-bot. Ges. Wien, vol. viii, p. 480 (1858); Selys, Ann. Soc. Ent. Belg. vol. xii, p. 95 (1869).

Diplax trivialis Brauer, Novara, p. 104 (1866); id., Verh. zool.-bot. Ges. Wien, vol. xvii, p. 289 (1867); id., ibid. vol. xviii, p. 721 (1868); id., ibid. vol. xix, p. 9 (1869); Selys, Mitt. Mus. Dresden, p. 294 (1878); Albarda, Veths. Midd. Sumatra, Neur. p. 3 (1881); Selys, An. Soc. Españ. Hist. Nat. vol. xi, p. 8 (sep.) (1882); id., Ann. Soc. Ent. Belg. vol. xxvii, p. 95 (1883); id., ibid. vol. xxviii, p. 32 (1884); id., C. R. Soc. Ent. Belg. June (1888); id., Ann. Mus. Civ. Genova, vol. xxvii, p. 450 (1889); id., An. Soc. Españ. Hist. Nat. vol. xx, p. 211 (1891).

Trithemis trivialis Kirby, Trans. Zool. Soc. Lond. vol. xii, p. 278 (1889); id., Cat. Odon. p. 18 (1890); Selys, Ann. Mus. Civ. Genova, vol. xxx, p. 467 (1891); Kirby, Proc. Zool. Soc. Lond. p. 203 (1891); id., J. Linn. Soc., Zool. vol. xxiv, p. 550 (1893); id., Ann. Mag. Nat. Hist. (7) vol. v, p. 531 (1900); Laidlaw, Proc. Zool. Soc. Lond. part 1, p. 66 (1902).

Diplacodes trivialis Karsch, Ent. Nachr. vol. xvii, p. 246 (1891); Calvert, Proc. Acad. Phil. p. 146 (1898); Karsch, Mitt. Mus. Senckenberg, vol. xxv, p. 219 (1900); Ris, Archiv für Natur. vol. i, p. 188 (1900); Martin, Mem. Soc. Zool. France, vol. xix, p. 224 (1901); Kruger, Stett. Ent. Zeit. vol. lxxiii, p. 126 (1902); Martin, Mission Pavie, p. 7 (sep.) (1904); Needham, Proc. U.S. Nat. Mus. vol. xxvii, pl. xli, figs. 8, 9 (1904); Kirby, Ann. Mag. Nat. Hist. (7) vol. xv, p. 271 (1905); Tillyard, Proc. Linn. Soc. N.S.W. vol. xxxi, p. 197 (1909); Ris, Cat. Coll. Selys, fasc. xii, pp. 462, 468-470, figs. 293, 294 (1910); id., ibid. fasc. xvi, p. 1153 (1916); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, pp. 501, 503, fig. 36 (1919); id., Rec. Ind. Mus. vol. xxvi, pp. 426, 434 (1924); Laidlaw, J. F.M.S. Mus. vol. xvi, pp. 224, 239 (1930); Fraser, Rec. Ind. Mus. vol. xxxiii, p. 446 (1931); Lieftinck, Treubia, livr. 4, vol. xiv, pp. 413, 414 (1934).

Male.—Abdomen 19-22 mm. Hind-wing 22-23 mm.

Head: labium, labrum, and bases of mandibles creamy-yellow; face, frons, and vesicle palest azure-blue, with a fine black line at base of frons; eyes reddish-brown above, pale bluish or yellowish below. *Prothorax* pale brown to black, with a mid-dorsal stripe extending full length of dorsum, and sometimes a spot, each yellow. *Thorax* greenish-yellow or olivaceous with sutures finely black, the area between mid-dorsal carina and humeral sutures violaceous-brown speckled with minute dots, this latter area and the black markings becoming pruinosed in adult specimens and, in very old adults, the whole thorax uniform pruinosed blue. *Legs* greenish-yellow, marked with black in subadults, black marked with yellow in adults, inner surface of anterior femora and extensor surface of tibiæ yellow in subadults. *Wings* hyaline, uncoloured save for a minute yellow point in cubital

space of hind-wing; nodal index $\frac{7-7\frac{1}{2}}{6-6} \mid \frac{7\frac{1}{2}-7}{6-6}, \frac{6-8\frac{1}{2}}{6-6} \mid \frac{7\frac{1}{2}-6}{6-6}$;

discoidal cell of fore-wing with costal side straight, narrower than in the previous species; reticulation rather closer; other details similar to genus. *Abdomen* with segments 1 to 3 greenish-yellow, with the sutures finely black and mid-dorsal and subdorsal black stripes extending from jugal suture on segment 2 and expanding broadly at apical borders of segments 2 and 3; all these markings more or less obscured by blue pruinescence in adults; remaining segments black, pruinosed densely in old adults, but with subdorsal yellow stripes on segments 4 to 7, extending from base to apex of segments 4 to 6 and nearly to apex on 7 in subadults. *Anal appendages* bright yellow, of typical Libelluline shape. *Genitalia* as for genus.

Female.—Abdomen 18-20 mm. Hind-wing 22-24 mm.

Resembles the subadult or teneral male in colour and markings, but the abdominal markings broader and continued on to segments 8 to 10, the latter entirely yellow as well as

anal appendages, whilst the spots on segments 8 and 9 are of variable length and may form a continuous yellow stripe from segment 1 to end of abdomen. Vulvar scale broad but short, scoop-shaped, projecting markedly in profile.

Distribution.—Extends from the Seychelles to the Pacific through INDIA, CEYLON, BURMA, and S. Asia to Formosa, and the Philippines. It is probably the commonest dragonfly found in India, and occurs from the plains up to over 7000 ft., in both dry and wet areas. It wanders far from water and is usually found settled on bare spots or footpaths in open spaces. (Large numbers came on board a vessel sixty miles off the Kathiawar coast on which I was taking a trip in 1918, so that it appears to be given to migratory flights). The clear wings, without apical or basal markings, and the creamy-white anal appendages and deep pruinescence in adult age, will serve to determine this species from others of the genus.

The *type* is in the Brussels Museum; other specimens in all national collections.

Genus **INDOTHEMIS** Ris. (Fig. 99.)

Indothemis Ris, Cat. Coll. Selys, fasc. ix, p. 29 (1909); id., *ibid.* fasc. xiii, pp. 529, 530 (1911); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, pp. 734, 735, fig. 43 (1919).

Libelluline dragonflies of moderate or rather small size, coloured black in the adult, or black marked with yellow

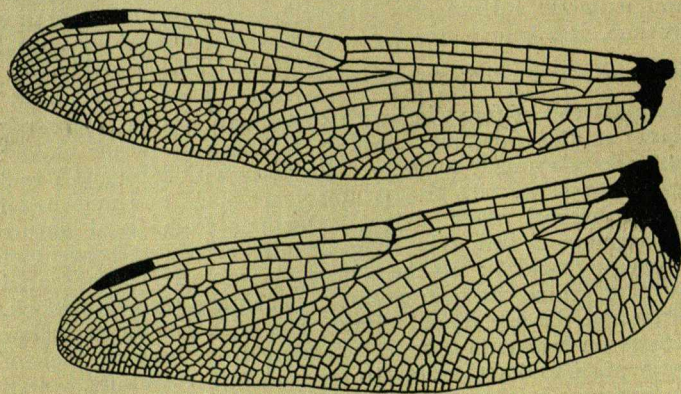


Fig. 99.—Wings of *Indothemis limbata sita* Campion, male.

in subadults. Head moderately large; eyes rather broadly contiguous; frons with well-defined crest and shallow sulcus; vesicle high, slightly notched. Prothorax with small posterior



lobe; thorax robust; legs slim, hind femora with about 12 evenly-sized robust spines and a longer one at distal end. Abdomen slim and cylindrical, but slightly broader at base and tapered very gradually to anal end. Wings hyaline; reticulation close or moderately so; discoidal cell in fore-wing with costal side angulated or not, short, much less than half the length of distal or basal sides, traversed or entire; that of hind-wing entire, with base at level of arc; sectors of arc with a long fusion in fore- and hind-wings; arc situated between the first and second antenodal nervures; $8\frac{1}{2}$ to $12\frac{1}{2}$ antenodal nervures, the distal one incomplete; 1 cubital nervure in all wings; *Cuii* in hind-wing arising from or separated from the posterior angle of discoidal cell; discoidal field beginning with 2 rows of cells, its borders diverging at wing-border; no supplementary nervures to bridge; subtrigone in fore-wing 3-celled; 1 row of cells between *IRiii* and *Rspl*; anal loop dilated at apex and with distal side strongly angulated; pterostigma moderately long; membrane very narrow. Genitalia of male small and inconspicuous in profile, variable in the species; female with projecting vulvar scales, scoop-shaped and slightly emarginate at apical border. Borders of segment 8 not dilated.

Genotype, *Libellula cæsia* Rambur.

Distribution.—INDIA, CEYLON, and BURMA, Malacca and Siam. This genus includes two species and one subspecies or geographical race, all of which are found within our limits. All breed in small, heavily weeded ponds and lakes and the imagines keep strictly to the neighbourhood of their birth-place, where they have a habit of lying up among scrub or long grass, settled in some bare depression of the ground. Species of this genus closely resemble species of *Trithemis*, but are easily distinguished by the borders of the discoidal field in the fore-wing diverging towards the wing-border, the opposite pertaining in *Trithemis*.

Key to Species of Indothemis.

- | | | | |
|----|---|---|---|
| 1. | { | Only $8\frac{1}{2}$ antenodal nervures in fore-wing;
apices of wings hyaline; base of hind-
wing unmarked | <i>cæsia</i> (Rambur), p. 340. |
| | | Fore-wing with $10\frac{1}{2}$ to $12\frac{1}{2}$ antenodal
nervures; apices of wings hyaline or
narrowly bordered with blackish-brown;
base of hind-wing with broad blackish-
brown opaque triangular marking | |
| 2. | { | Apices of wings finely bordered with
blackish-brown; $11\frac{1}{2}$ to $12\frac{1}{2}$ antenodal
nervures in fore-wing | [p. 341.
<i>limbata limbata</i> (Selys). |
| | | Apices of wings clear; only $10\frac{1}{2}$ antenodal
nervures in fore-wing | [p. 342.
<i>limbata sita</i> Campion, |

482. *Indothemis cæsia* (Rambur).

Libellula cæsia Rambur, Ins. Névro-p. p. 95 (1842).

Trithemis cæsia Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, p. 736 (1868); Kirby, Cat. Odon. p. 19 (1890).

Diplax meridionalis Selys, Ann. Soc. Ent. Belg. vol. xxviii, p. 36 (1884).

Indothemis cæsia Ris, Cat. Coll. Selys, fasc. xiii, pp. 529-531 (1911); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, pp. 735, 736 (1919); id., Rec. Ind. Mus. vol. xxvi, pp. 426, 436, 437 (1924); id., ibid. vol. xxxiii, p. 446 (1931).

Male.—Abdomen 25-26 mm. Hind-wing 28-31 mm.

Head: labium ochreous, middle lobe and borders of lateral lobes black; labrum and face blackish-brown with a yellow spot on each side of postclypeus; frons and vesicle metallic violet-black with a small triangular yellow spot on each side of former; occiput brown; eyes violaceous above, paler below; behind head bright yellow. *Prothorax* blackish-brown, mid-dorsum paler brown, anterior lobe finely yellow anteriorly. *Thorax* blackish-brown, overlaid thinly with pruinescence and appearing uniformly dark violaceous in full adults; subadults with the greenish-yellow ground-colour showing obscurely through pruinescence, especially on metepimeron; tenerals coloured similarly to female. *Legs* black, femora, except at distal ends, and extensor surface of tibiæ greenish-yellow. *Wings* hyaline, with a small point of amber-

yellow at base of hind; nodal index $\frac{7-8\frac{1}{2}}{7-7} \mid \frac{8\frac{1}{2}-7}{7-7}$; pterostigma

bright ochreous between thick black nervures; membrane blackish-brown; discoidal cell in fore-wing always traversed once; *Cu₁* in hind-wing always widely separated from posterior angle of discoidal cell and arising from its distal side. *Abdomen* dark violaceous or blackish-brown with yellow markings obscurely showing through; teneral forms with abdomen coloured as in female. *Anal appendages* dull ochreous, of the usual Libelluline shape. *Genitalia*: lamina rather depressed, strongly arched; hamules with narrowly triangular foliate base and short, robust, moderately straight hook; lobe broad and rounded, constricted at base.

Female.—Abdomen 24 mm. Hind-wing 29 mm.

Differs very widely from the male in colour and markings. *Head*: labium, labrum, face, frons, vesicle, and occiput bright yellow, clypeus and sides of frons with greenish tint; eyes brown above, golden-yellow below. *Prothorax* ochreous with a diffuse reddish-brown elongate spot on each side of middle lobe. *Thorax* golden-yellow on dorsum, pale greenish-yellow laterally, with a diffuse brown antehumeral stripe mid-way between humeral suture and mid-dorsal carina, incomplete above and below; antealar sinus with borders

studded with dark brown points; upper ends of lateral sutures narrowly dark brown to black. *Legs* entirely yellow save tarsi and spines which are black. *Wings* similar to male. *Abdomen* golden-yellow on dorsum, fading to greenish-yellow laterally, marked with black and reddish-brown as follows:—All sutures and ventral borders finely mapped out in black; a narrow subdorsal stripe extending in a very broken manner from segment 2 to the end of abdomen and fusing with black of ventral border on segments 5 to 9; a mid-dorsal stripe black on carina, the brown at its borders extending from segment 2 to 9, broadening on the terminal segments and becoming confluent with the subdorsal stripe; segment 10 yellow, with base and apical border narrowly black. Old adults with these markings more extensive and enclosing the yellow as lateral elongate spots. *Anal appendages* pale yellow tipped with black; vulvar scales as for genus.

Distribution.—Confined to PENINSULAR INDIA and Siam in moderately wet zones. I have specimens from Parel tank, Bombay; Masnagudi at foot of Sigur Ghat Nilgiris, a rather dry area; and from Hasimara, Jalpaiguri District, Bengal. I have one male from Bangkok, Siam, the only specimen that has been taken from without Indian limits. This species closely resembles *Trithemis festiva*, but is at once determined by its discoidal field commencing with 2 rows of cells instead of 3, and by the sides of the field divergent at wing-border. It is a comparatively local insect, and I have only found it common around the Masnagudi tank.

Few specimens appear to have found their way into museums. The *type*, a male from Bombay, is in the Brussels Museum collection; specimens of both sexes in Mr. Morton's and the Author's collection, the former from Jubbelpore, C.P., India.

483. *Indothemis limbata limbata* (Selys).

Trithemis limbata Selys, Ann. Mus. Civ. Genova, vol. xxx, p. 463 (1891).

Indothemis limbata Ris, Cat. Coll. Selys, fasc. xiii, pp. 530-531 (1911); Fraser, J. Siam. Soc., Nat. Hist. Suppl. vol. vii, p. 84 (1927); Laidlaw, J. F.M.S. Mus. vol. xvi, p. 224 (1930).

Male.—Abdomen 22 mm. Hind-wing 27 mm.

Head: labium, labrum, face, frons, vesicle, and occiput black, sides of face and frons and bases of mandibles yellowish or pale brown, frons and vesicle with purplish-steely reflex; eyes black above, brown below. *Prothorax*, *thorax*, and *abdomen* uniformly black; *legs* black; *wings* hyaline, apices very narrowly blackish-brown for not more than 1 cell deep; bases of wings dark mahogany-brown, from extreme base in fore-wing to slightly distal of first antenodal nervure, and posteriorwards nearly as far as tornus of hind-wing,

the colour paler in the costal and basal spaces ; nodal index $9-12\frac{1}{2} \mid 12\frac{1}{2}-9$
 $8-8 \mid 8-8$; other details similar to those of *I. cæsia* ; pterostigma ochreous, paler along posterior border, bordered with a thick black nervure anteriorly and a thin one posteriorly ; membrane black. *Anal appendages* black, of the usual Libelluline shape. *Genitalia* very similar to the last species, but hamules not overlapping lobe and the latter not expanded, subquadrate.

Female unknown.

Distribution.—BURMA, Siam, and Malacca. Very few specimens of this species are known. The type-specimen is the only one which has been taken within Indian limits, and comes from Teinzo, Burma. There is a male in the Hamburg Museum and two males in the British Museum. I possess three males from Siam. The species is easily determined from others by the apices of the wings bordered with blackish-brown.

The *type*, an incomplete male, is in the Genoa Museum.

484. *Indothemis limbata sita* Campion. (Fig. 99.)

Indothemis limbata sita Campion, Ann. Mag. Nat. Hist. (9) vol. xi, pp. 28-31 (1923) ; Fraser, Rec. Ind. Mus. vol. xxxiii, pp. 446, 449 (1931) ; Needham, Rec. Ind. Mus. vol. xxxiv, p. 206 (1932).

Indothemis limbata Fraser, Rec. Ind. Mus. vol. xxvi, pp. 426, 435, 436 (1924).

Male.—Abdomen 23 mm. Hind-wing 29 mm.

Resembles the male of *I. limbata limbata*, differing only by being entirely black without paler markings on face and by the wings without any dark border to apices. Nodal index variable, $8-10\frac{1}{2} \mid 10\frac{1}{2}-9$
 $9-9 \mid 9-9$. In most specimens the basal marking rather more extensive, reaching the first antenodal nervure in fore-wing and second antenodal and arc in hind-wing and right up to tornal angle. *Genitalia* similar.

Female.—Abdomen 20-21 mm. Hind-wing 26 mm.

Head : labium black, with a very large yellow spot on each lateral lobe ; labrum and mandibles bright ochreous, with anterior border of labrum and a small median basal spot black ; face and frons ochreous, with the base of latter above narrowly and the lower border black, but slightly interrupted in the middle below ; vesicle black ; occiput reddish-ochreous bordered with black ; eyes brown, black behind, bordered with bright ochreous. *Prothorax* black ; *thorax* bright yellow marked with black and brown as follows :—A broad mid-dorsal dark reddish-brown fascia, an antehumeral stripe black bordered with brown and confluent below with a sinuous

black humeral stripe ; a black stripe on mesepimeron and a dark brown one on postero-lateral suture, the intervening area suffused with reddish-brown. *Legs* black, anterior femora yellow within. *Wings* with venation similar to male, but the base amber-yellow instead of blackish-brown ; pterostigma creamy-white between black nervures ; *abdomen* with segments 1 to 3 yellow, with fine black sutures and mid-dorsal and subdorsal black narrow stripes extending from jugal suture on segment 2 ; segments 4 to end black, marked with bright yellow as follows :—Segments 4 to 8 with elongate subdorsal and ventro-lateral spots extending from base and tapered strongly apicalwards, the spots on segment 4 equal in length, those on 5 to 8 with lower spot the shorter and all gradually shortening towards anal segments and quite vestigial on 8 ; segment 9 with a tiny basal subdorsal spot ; segment 10 black. *Anal appendages* black ; vulvar scale similar to that of *I. cæsia*.

Distribution.—CEYLON and WESTERN INDIA only. This species is distinguished from *I. cæsia* by its higher antenodal index and from *I. limbata limbata* by the wings unmarked at the apices. All my own specimens were taken in Coorg, where it was not uncommon ; they were found haunting small weedy tanks, keeping well out in the centre, and so shy that I was reduced to bringing them down with dust-shot. Later, when they became more plentiful, several were taken with the net when engaged in fighting their own kind and other dragonflies. Females are rare and appear to hide in surrounding jungle.

The *type*, a male, in the British Museum ; several males and four females in the Author's collection.

Genus CROCOTHEMIS Brauer. (Fig. 100.)

Crocotthemis Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, pp. 367, 736 (1868) ; Kirby, Trans. Zool. Soc. Lond. vol. xii, pp. 263, 279 (1889) ; id., Cat. Odon. p. 21 (1890) ; Förster, Jber. Mannheim, vols. lxxi, lxxii, pp. 12, 19 (sep.) (1906) ; Ris, Cat. Coll. Selys, fasc. ix, p. 29 (1909) ; id., ibid. fasc. xiii, pp. 532, 533 (1911) ; Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, pp. 515, 516 (1919).

Beblicia Kirby, Ann. Mag. Nat. Hist. (7) vol. vi, p. 71 (1900).

A genus of Libelluline dragonflies of rather homogeneous appearance, usually coloured uniform red and with hyaline wings. Head of moderate size ; eyes shortly contiguous ; frons with deep sulcus which divides two flattened, sloping, horseshoe-shaped surfaces ; vesicle rounded, low. Prothorax with small posterior lobe ; thorax robust ; legs rather short, robust, hind femora with numerous closely-set small spines of uniform size and a longer one at distal end ; abdomen

depressed, moderately broad to broad at base and tapered gradually to the end in the male, cylindrical in the female. Wings hyaline or partly coloured at extreme base; reticulation close; long and narrow, pointed at apices; discoidal cell in fore-wing narrow, costal side straight, only half the length of distal and basal sides, traversed; discoidal cell of hind-wing with base at level of arc, usually entire; sectors of arc shortly fused in fore-wing, with a long fusion at origin in the fore; arc situated between the first and second antenodal nervures; $7\frac{1}{2}$ to $14\frac{1}{2}$ antenodal nervures, the distal one incomplete; 1 cubital nervure in all wings; *Cu* usually arising from the posterior angle of discoidal cell in hind-wing; discoidal field beginning with 3 rows of cells, widely divergent at wing-border; no supplementary nervures to bridge; subtrigone in fore-wing with 3 cells; 1 or 2 rows of cells between *IR* and *R*

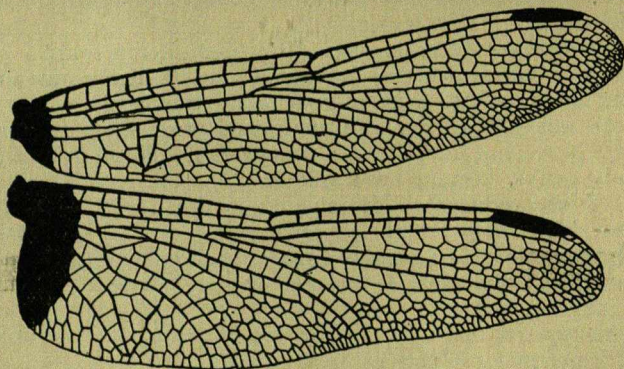


Fig. 100.—Wings of *Crocothemis servilia servilia* (Drury), male.

and *R*₁; anal loop widely dilated at distal end and with distal side right-angled; pterostigma and membrane large. Genitalia: lamina depressed, strongly arched; base of hamules foliate, elongate, rectangular, with hooks strongly curled, slim, bent inwards and backwards; lobe elongate oval and directed posteriorwards. Female with borders of segment 8 not dilated; vulvar scale projecting as a pointed scoop.

Genotype, *Libellula servilia* Drury.

Distribution.—Throughout Continental Africa and Madagascar, S. Europe, Arabia, Mesopotamia, INDIA, S. China, and Japan, S. Asia, the Sundaic Archipelago, New Guinea, Philippines, and Australia. Two species are found within our limits, one of which is found everywhere and at all altitudes up to 7,000 ft. Species of this genus breed in still waters, but occasionally in the beds of streams during the dry season when the falling level of water leaves stagnant pools behind.

They are bright, sun-loving insects, shunning close jungly country and frequenting the small weedy tanks about the habitations of man. No genotype appears to have been cited for *Crocotthemis*, so that I have chosen *servilia* as the first described species.

485. *Crocotthemis servilia servilia* (Drury). (Fig. 100.)

- Libellula servilia* Drury, Ill. Ex. Ins. vol. i, pl. xlvii, fig. 6, pp. 112, 113 (1770); Rambur, Ins. Névp. p. 80 (1842).
Libellula ferruginata Fabricius, Spec. Ins. vol. i, p. 521, no. 11 (1781).
Libellula ferruginea Fabricius, Ent. Syst. vol. ii, p. 380 (1793); Burmeister, Handb. Ent. vol. ii, p. 858 (1839); Hagen, Stett. Ent. Zeit. vol. v, p. 259 (1845); Calvert, Trans. Amer. Ent. Soc. vol. xxv, p. 88 (1898).
Libellula soror Rambur, Ins. Névp. p. 82 (1842); Hagen, Verh. zool.-bot. Ges. Wien, vol. viii, p. 480 (1858).
Erythemis servilia Brauer, Novara, p. 104 (1866).
Crocotthemis servilia Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, p. 737 (1868); Albarda, Veths. Midd. Sumatra, Neur. p. 4 (1881); Selys, An. Soc. Españ. Hist. Nat. vol. xi, p. 14 (sep.) (1882); id., Ann. Soc. Ent. Belg. vol. xxvii, p. 105 (1883); id., Ann. Mus. Civ. Genova, vol. xxvii, p. 468 (1889); Kirby, Cat. Odon. p. 21 (1890); Selys, Ann. Mus. Civ. Genova, vol. xxx, p. 468 (1891); Karsch, Ent. Nach. vol. xvii, p. 42 (1891); Kirby, Ann. Mag. Nat. Hist. (6) vol. xiv, p. 18 (1894); MacLachlan, ibid. (6) vol. xiii, p. 432 (1894); id., ibid. (6) vol. xvii, p. 366 (1896); Kirby, ibid. (7) vol. v, p. 532 (1900); Martin, Mem. Soc. Zool. France, vol. xix, p. 224 (1901); Laidlaw, Proc. Zool. Soc. Lond. part 1, p. 67 (1902); Kruger, Stett. Ent. Zeit. vol. lxiii, p. 117 (1902); Morton, Trans. Ent. Soc. Lond. p. 304 (1907); Ris, Cat. Coll. Selys, fasc. xiii, pp. 533, 539-542 (1911); Morton, Ent. Month. Mag. (3) vol. v, pp. 187-189 (1919); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, pp. 516, 517 (1919); Morton, Ann. Mag. Nat. Hist. (9) vol. v, pp. 300, 301 (1920); Fraser, Rec. Ind. Mus. vol. xxvi, pp. 426, 437 (1924); Laidlaw, J. F.M.S. Mus. vol. xvi, pp. 226, 239 (1930); Fraser, Rec. Ind. Mus. vol. xxxiii, p. 446 (1931); Lieftinck, Treubia, vol. xiv, livr. 4, pp. 417, 418 (1934).
Crocotthemis erythræa Selys, Mitt. Mus. Dresden, p. 294 (1878); Martin, Mission Pavie, p. 5 (sep.) (1904); id., Bull. Soc. Ital. vol. lx, p. 196 (1909).
Crocotthemis servilia race *erythræa* Selys, Ann. Mus. Civ. Genova, vol. xiv, p. 305 (1879).
Crocotthemis reticulata Kirby, Proc. Zool. Soc. Lond. p. 328, pl. xxxiii, fig. 8 (1886); id., Cat. Odon. p. 22 (1890).
Crocotthemis soror Kirby, Proc. Zool. Soc. Lond. p. 328 (1886); id., J. Linn. Soc., Zool. vol. xxiv, p. 551 (1893).
Crocotthemis erythræa subrace *novaguineensis* Förster, Természetr. fasc. xxi, p. 288 (1898).

Male.—Abdomen 24-35 mm. Hind-wing 27-38 mm.

Head: labium ferruginous; labrum blood-red bordered diffusely with darker red; anteclypeus pale red, rest of face and frons bright blood-red; vesicle red; occiput bright orange; eyes during life blood-red above, purple laterally,



paler below. *Prothorax* ferruginous, with a spot on middle of anterior lobe and borders of posterior lobe brighter rust-red ; middle lobe ridged transversely, this ridge bearing a ruff of stiff reddish hairs. *Thorax* bright ferruginous, often blood-red on dorsum during life. *Legs* ochreous. *Wings* hyaline, bases of all marked with rich amber-yellow to as far distal as the cubital nervure in fore-wing and to first antenodal nervure nearly to arc and right up to and including the tornal angle in hind-wing ; apices of wings lined narrowly with pale brown in old specimens ; nodal index $\frac{9-10\frac{1}{2}}{9-9} \mid \frac{10\frac{1}{2}-9}{9-9}$; pterostigma dark ochreous between blackish nervures ; membrane dark reddish-brown. *Abdomen* blood-red, segments 8 and 9 with mid-dorsal carina blackish. *Anal appendages* blood-red. *Genitalia* as for genus.

Female.—Abdomen 25–32 mm. Hind-wing 31–37 mm.

Differs rather widely in colouring from the male, as follows :—Labium pale yellow ; labrum, face, frons, and vesicle olivaceous-yellow ; occiput olivaceous-brown ; eyes brown above, olivaceous below. *Prothorax* and *thorax* olivaceous-brown, often tinged with ferruginous ; *legs* ochreous. *Wings* similar to male, but basal marking paler in tint and the neuration in this part bright yellow instead of bright orange. *Abdomen* ochreous, segments 8 and 9 blackish along mid-dorsal carina. *Anal appendages* ochreous, shortly conical ; vulvar scale very prominent, projecting at a right angle to plane of abdomen.

Distribution.—Mesopotamia, INDIA, CEYLON, and BURMA, S. Asia to Japan, the Philippines, and Australia and southwards to the Sundaic Archipelago. This species can only be confounded with *Orthetrum testacea* or *chrysis*, from both of which it is easily determined by the small posterior lobe of prothorax. From *C. servilia erythræa* distinction is more difficult ; Morton gives the presence of a humeral stripe, but this is only present in the teneral and subadult stage, rarely in the full adult and never in dried adults ; he also gives good characters in the genitalia, those of *servilia servilia* having the posterior end of hamule more obtuse and the hook in *servilia erythræa* having a small spine near its apex which is absent in *servilia servilia*. In addition to this, the latter has the mid-dorsal carina of segments 8 and 9 marked with black, but entirely red in *erythræa*. Teneral males and females may give rise to confusion on account of their pale straw-yellow colour, quite different from the adult stage ; such specimens may often be found rising in scores from reeds and tall grasses bordering their watery habitats. In these specimens there is a well-defined pale yellowish-white humeral stripe on each side of thorax, and a subdorsal stripe of the same colour runs the length of abdomen ; the basal marking of wing

is paler, the reticulation bright yellowish, and the pterostigma very pale yellow between black nervures.

The *type* has been lost; Fabricius's *type* of *L. ferruginata* is in the British Museum, as also is Kirby's *type* of *L. reticulata*. Examples of both sexes are found in all national collections.

486. *Crocothemis servilia erythræa* (Brullé).

- Libellula ferruginea* Vander Linden, Mon. Lib. Eur. p. 13 (1825); Fonscolombe, Ann. Soc. Ent. France, vol. vi, p. 142 (1837); Burmeister, Handb. Ent. vol. ii, p. 858 (1839); Selys, Mon. Lib. Eur. pp. 27, 42, 207 (1840); Rambur, Ins. Névro. p. 79 (1842); Schneider, Stett. Ent. Zeit. vol. vi, p. 111 (1845); id., ibid. vol. vi, p. 339 (1845); Brittinger, S.B. Akad. Wiss. Wien, vol. iv, p. 332 (1850).
- Libellula erythræa* Brullé, Exped. Morée, vol. iii, (1) p. 102, pl. xxxii, fig. 4 (1832); Hagen, Stett. Ent. Zeit. vol. x, p. 69 (1849) (Brullé's typen existieren nicht mehr.); Selys, Rev. Odon. pp. 24, 382 (1850), etc.
- Libellula coccinea* Charpentier, Lib. Eur. p. 70, pl. vii, fig. (1840); Hagen, Syn. Lib. Eur. p. 28 (1840).
- Libellula inquinata* Rambur, Ins. Névro. p. 86 (1842); Selys, Pollen & Van Dam, Madagas., Ins. p. 22 (1869).
- Crocothemis inquinata* Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, p. 737 (1868); Kirby, Cat. Odon. p. 22 (1890).
- Crocothemis erythræa* Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, p. 737 (1868); Calvert, Proc. Acad. Phil. p. 153 (1898); Morton, Trans. Ent. Soc. Lond. p. 304 (1907); Ris, Cat. Coll. Selys, fascs. xiii & xvi, pp. 533, 536-539, 1165 (1911-1913) (for further and complete list of references consult this last); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, p. 516 (1919); Morton, Ent. Month. Mag. (3) vol. v, pp. 186, 187 (1919).
- Crocothemis servilia servilia* var. *erythræa* Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, p. 517 (1919).
- Orithetrum lorti* Kirby, Proc. Zool. Soc. Lond. p. 522 (1896).

Male.—Abdomen 25-27 mm. Hind-wing 27-35 mm.

Differs only from *servilia servilia* by segments 8 and 9 of abdomen without black markings on mid-dorsal carina; by the base of hamules more acute and prolonged, and by the hooks of same without a minute tooth near apex. *Wings* without brown suffusion at apex, basal amber-tinted marking slightly more extensive, and reticulation rather more open.

Distribution.—S. Europe, Africa from Cape to Cairo, Arabia, Mesopotamia, and N.W. INDIA. The differences between this insect and *servilia servilia* have been set forth above; it differs from *O. testaceum* and *chrysis* in the same character as does *servilia servilia*. Dr. Ris in his monograph on the Libellulinae says: "The treatment of *C. servilia* as a species apart from *erythræa* is a matter of convenience," but the differences are so fine that I consider racial or subspecific rank more appropriate to meet the case, and *servilia* takes priority as having been first described.

The whereabouts of the *type* is unknown, but according to Hagen is lost. Specimens in all national collections.

Genus **BRADINOPYGA** Kirby. (Fig. 101.)

Bradinopyga Kirby, J. Linn. Soc., Zool. vol. xxiv, p. 553 (1893); Calvert, Proc. Acad. Phil. p. 241 (1899); Ris, Cat. Coll. Selys, fascs. ix-xiii, pp. 29, 544, 555 (1910-1911); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, p. 514 (1919).
Apeleutherus Kirby, Ann. Mag. Nat. Hist. (7) vol. vi, p. 73 (1900).

Libelluline dragonflies of moderate size with cryptic colouring in black, greys, and white, and with hyaline wings. Head moderately large; eyes broadly contiguous; frons with crest rounded, sulcus narrow and deep; vesicle rounded or notched. Prothorax with small, rounded, posterior lobe; thorax robust; legs rather short, slim; hind femora with numerous closely-set short spines; abdomen slightly dilated at base, then very

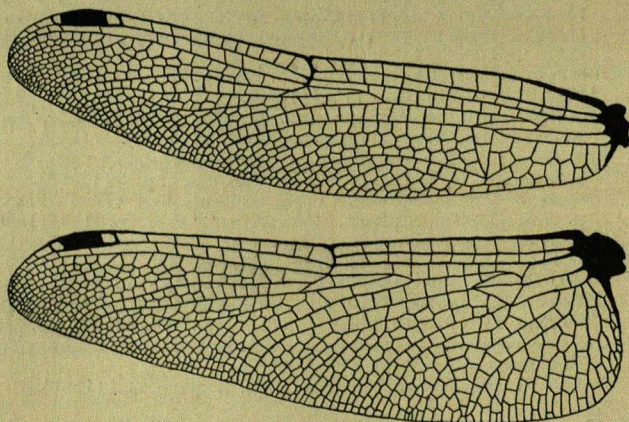


Fig. 101.—Wings of *Bradinopyga geminata* (Rambur), male.

narrow, triquetral, dorsum strongly ridged. Genitalia: lamina depressed, broadly arched; hamules very small, with small triangular basal portion and short strongly-curved hooks; lobe higher than hamules, right-angled to plane of abdomen and a little dilated at end. Wings hyaline, long, and moderately narrow, reticulation close or very close; discoidal cell in fore-wing narrow, costal side less than half the length of basal and distal sides, traversed once or twice; discoidal cell in hind-wing with base at the arc, entire or traversed, distal side concave; sectors of arc with wide fusion; arc situated between the first and second antenodal nervures $10\frac{1}{2}$ to $12\frac{1}{2}$ antenodal nervures, the distal one incomplete; 1 cubital nervure in all wings; *Cu* arising from the posterior angle of discoidal cell in hind-wing; discoidal field beginning with 3 or 4 rows of cells, widely divergent at the wing-border;

no supplementary nervures to bridge; 2 or 3 rows of cells between *IRiii* and *Rspl*; anal loop very broadly dilated at end and with distal side strongly angulated and midrib forked; pterostigma of moderate size, bicolorous; membrane large.

Genotype, *Libellula geminata* Rambur.

Distribution.—Africa and PENINSULAR INDIA. Only one species is known from within our limits, and this is widely spread throughout the plains, where it breeds in small pools or wells.

487. ***Bradinopyga geminata*** (Rambur). (Fig. 101.)

Libellula geminata Rambur, Ins. Névropl. p. 90 (1842).

Trithemis geminata Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, p. 736 (1868); Kirby, Cat. Odon. p. 19 (1890).

Bradinopyga stigmata Kirby, J. Linn. Soc., Zool. vol. xxiv, p. 553 (1893).

Bradinopyga geminata Ris, Cat. Coll. Selys, fasc. xiii, pp. 545, 548, fig. 324 (1911); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, pp. 514, 515 (1919); id., Rec. Ind. Mus. vol. xxvi, pp. 426, 437 (1924); id., ibid. vol. xxxiii, p. 446 (1931).

Male.—Abdomen 26–29 mm. Hind-wing 33–36 mm.

Head: labium pale yellowish-white, often blotched with brownish; labrum palest yellow or dark brown with a broad yellow bordering which is again finely bordered with reddish-brown; rest of face and frons olivaceous or cinereous; vesicle and occiput brown; eyes brown above, pale greyish beneath. **Prothorax and thorax** cinereous or dirty pale yellow, marbled and peppered with black in a very irregular manner (best described as granite in colour); **legs** cinereous or greyish, thinly pruinose. **Wings** hyaline; pterostigma black at centre, pure white at distal and proximal ends, between black nervures; nodal index $\frac{9-11\frac{1}{2}}{9-9} \mid \frac{11\frac{1}{2}-9}{9-9}$; 2 rows of cells

between *IRiii* and *Rspl*; discoidal field beginning with 3 rows of cells; membrane black, with attached border white or cinereous. **Abdomen** coloured very similarly to thorax, black marbled with yellow, but with a more definite plan—segments 3 to 8 with pale basal annules interrupted on dorsum and formed by two elongate parallel spots, one ventro-lateral, the other subdorsal; a triangular apical subdorsal spot and a pale mid-dorsal spot. **Anal appendages** pale creamy-white, of the usual Libelluline shape. **Genitalia** as for genus.

Female.—Abdomen 26–29 mm. Hind-wing 32–36 mm.

Exactly similar to the male, differing only in sexual characters. **Anal appendages** half as long again as segment 10, creamy-white, conical; vulvar scales small, not projecting, about half the length of segment 9, rounded or arched at apical border.



Distribution.—PENINSULAR INDIA only, at altitudes varying from sea-level to 1,500 ft. This species furnishes a fine example of protective, cryptic colouring which is enhanced by its actions, which seem to betray a knowledge of the value of such colouring. In the feral state this species is found in granitic country breeding in rainy hollows in the rocks and invariably settling, with wings flattened, on the granite face, with which their marbled grey-coloured body harmonizes to such an extent that they are practically invisible. It is a species which has, however, invaded cultivated and occupied areas and, in such, breeds in wells and small cemented tanks; in such localities it will be found settling on the well-side or on plastered cemented walls. Towards dusk many have the habit of invading verandahs and sleeping on the ropes of tattie screens. I have seen them, head to tail, to the number of twenty or more, in such situations. The bicolorous pterostigma further adds to their cryptic colouring. Lieftinck ascribes similar habits to *Tyriobapta torrida*, which settles on the trunks of trees, with which its colour harmonizes, but only during its teneral condition; in the fully adult stage it becomes totally black, and its colour renders it very conspicuous; this is not so with *B. geminata*, which, as it reaches adult age, become thinly pruinosed, a circumstance which increases its greyness and invisibility. The colouring and piebald pterostigma will serve to distinguish it from any other Indian species.

The type is in the Selys collection, Brussels Museum; Kirby's type of *B. stigmata* is in the British Museum. Numbers of both sexes in the Author's collection.

Genus **NEUROTHEMIS** Brauer. (Fig. 102.)

Polynewa Rambur, Ins. Névropt. p. 26 (1842); Hagen, Stett. Ent. Zeit. vol. x, p. 170 (1849).

Neurothemis Brauer, Verh. zool.-bot. Ges. Wien, vol. xvii, pp. 6, 289 (1867); id., ibid. vol. xviii, pp. 366, 717 (1868); Selys, Ann. Mus. Civ. Genova, vol. xiv, p. 290 (1874); Kirby, Trans. Zool. Soc. Lond. vol. xii, pp. 260, 271 (1889); Förster, Természetr. fasc. xxi, p. 273 (1898); Kruger, Stett. Ent. Zeit. vol. lxiv, p. 248 (1903); Ris, Cat. Coll. Selys, fascs. ix & xiii, pp. 29, 548-553 (1909, 1911); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, pp. 506-508 (1919).

Untamo Kirby, Trans. Zool. Soc. Lond. vol. xii, pp. 260, 284 (1889); Karsch, Berlin, Ent. Zeit. vol. xxxiii, p. 357 (1890).

Libelluline dragonflies of moderate size characterized by the wings partly or wholly coloured in one or both sexes and often by a very close reticulation of the wings; body usually coloured some shade of yellow or reddish-brown. Head moderately large; eyes rather shortly contiguous; frons rounded, but with well-defined crest in the male, less so in the female; vesicle large, very slightly notched. Prothorax

with small posterior lobe, arched and slightly emarginate; thorax robust; legs moderately long and slim, hind femora with a row of rather numerous, gradually lengthening spines. Abdomen relatively short, slightly dilated dorso-ventrally at base, then slim and tapered very gradually to the anal end; rather compressed and subcylindrical in the female. Wings rather broad; reticulation close, a secondary closer reticulation often present in the coloured basal parts of wings; discoidal cell of fore-wing rather broad, costal side half the length or more than half the length of distal and basal sides, traversed or filled with a close net-work of nervures; discoidal cell of hind-wing with base at level of arc, traversed, often many times, distal side markedly concave; sectors of arc with short fusion in fore-wing, a long fusion in the hind; arc lying between the first and second antenodal nervures;

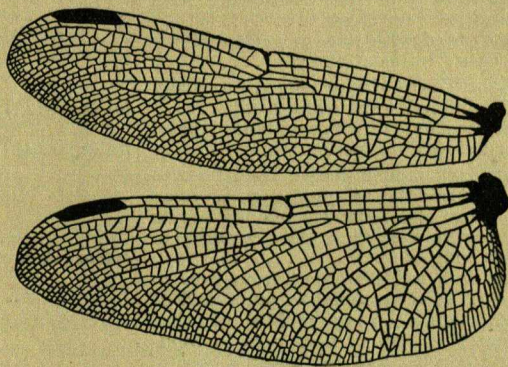


Fig. 102.—Wings of *Neurothemis terminata* Ris, male.

antenodal nervures never less than $11\frac{1}{2}$, distal one complete in fore-wing; several cubital nervures in fore-wing, 1 or more in the hind; *Cu_{ii}* arising from the posterior angle of discoidal cell in hind-wing; discoidal field beginning with 3 cells or filled with a close reticulation, its borders nearly parallel and but slightly divergent at wing-border; supplementary nervures to the bridge present; subtrigone in fore-wing with 3 or numerous cells; 1 or 2 rows of cells between *IR_{iii}* and *Rs_{pl}*; anal loop dilated at apical end and distal side strongly angulated; pterostigma and membrane moderately large. Genitalia: lamina depressed, broadly arched; hamules with base foliate, projecting posteriorwards, hooks acuminate, strongly curled; lobe narrowly oval, about as long as hamules. Border of segment 8 in female not dilated; vulvar scale prolonged, moderately large, acutely oval.

Genotype, *Libellula fulvia* Drury.

Distribution.—Tropical Asia and Sundaic Archipelago, Borneo, New Guinea, Philippines, and Australia. The genus consists of several closely related species and others which vary much more widely. Seven species are found within our limits, only two of which are found in Ceylon. (*N. fluctuans* has been reported in error from Ceylon, whilst *N. fulvia* has not yet been reported from that island, but will most certainly be found there; *N. tullia tullia* and *N. intermedia* are both common there.) Several species possess polymorphic and isomorphic females; all breed in swamps, marshes or stagnant waters, and are generally found in large colonies in the neighbourhood of their watery habitat.

Key to Indian Species of Neurothemis.

1. { Bases of wings of male broadly black ... 2.
 { Wings broadly dark reddish-brown with
 { neuration very close 3.
 { Wings tinted with pale or golden-yellow
 { at base; reticulation open 4.
2. { Black basal area of wings edged outwardly [p. 360.
 { with an opalescent white band *tullia tullia* (Drury),
 { Black basal area of wings without a distal [p. 362.
 { bordering of opalescent white *tullia feralis* (Burm.),
3. { Wings dark reddish-brown from base to
 { about middle of pterostigma, apex
 { of wings also narrowly opaque brown
 { to partly enclose a clear window in
 { each wing at apex *fulvia* (Drury), p. 353.
 { Wings dark reddish-brown from base to
 { 1 or 2 cells proximal of inner end of
 { pterostigma or to middle of that
 { organ; margin of dark area in hind-
 { wing curving fan-wise towards base of
 { wing; apices of wings clear [p. 355.
 { *fluctuans* (Fabricius),
4. { Wings pale golden-yellow from base to
 { within 2 cells proximal of pterostigma;
 { this area with border running straight
 { back to posterior border and turning
 { rather abruptly towards base of wing
 { just before that margin (old adults
 { with this coloured area deeply enfumed
 { blackish-brown); humeral stripe absent
 { on thorax [Selys, p. 359.
 { *intermedia degener*
 { Base of wings golden-yellow to as far
 { distal as outer border of discoidal cell
 { or a few cells beyond 5.
5. { Yellow area at base of wings not very
 { sharply defined and rather pale in
 { colour; costal border of wings pale
 { yellow to as far as pterostigma; a pale
 { brown humeral stripe on thorax [(Rambur), p. 357.
 { *intermedia intermedia*
 { Yellow area at base of wings very well
 { defined and deep amber-yellow, often
 { enfumed with brown; costal border of
 { wings not tinted with yellow as a rule,
 { humeral stripe absent on thorax [Ris, p. 358.
 { *intermedia atalanta*

488. *Neurothemis fulvia* (Drury).

- Libellula fulvia* Drury, Ill. Exot. Ins. vol. ii, pl. xlv, fig. 2, pp. 84, 85 (1773); Burmeister, Handb. Ent. vol. ii, p. 853 (1839); Calvert, Trans. Amer. Ent. Soc. vol. xxv, p. 70 (1898).
- Libellula sophronia* Drury, Ill. Exot. Ins. vol. ii, pl. xlvii, fig. 4, p. 86 (1773).
- Libellula apicalis* Guérin-Ménéville, Voy. Coquille, Zool. vol. ii, 2, p. 194 (1838).
- Polyneura fulvia* Rambur, Ins. Névro. p. 129 (1842); Brauer, Novara, p. 104 (1866).
- Polyneura sophronia* Rambur, Ins. Névro. p. 128 (1842).
- Neurothemis sophronia* Brauer, Verh. zool.-bot. Ges. Wien, vol. xvii, p. 9 (1867); id., ibid. vol. xviii, p. 717 (1868); Hagen, Stett. Ent. Zeit. vol. xxx, p. 96 (1869); Selys, Ann. Mus. Civ. Genova, vol. xiv, pp. 290, 292 (1879); id., ibid. vol. xxx, p. 446 (1891); Kruger, Stett. Ent. Zeit. vol. lxiii, p. 126 (1902) id., ibid. vol. lxiv, p. 285 (1903); Martin, Mission Pavie, Zool. p. 5 (sep.) (1904).
- Neurothemis fulvia* Kirby, Trans. Zool. Soc. Lond. vol. xii, p. 271, pl. lv, fig. 2 (1889); id., Cat. Odon. p. 7 (1890); id., Ann. Mag. Nat. Hist. (6) vol. xiv, p. 112 (1894); Laidlaw, Proc. Zool. Soc. Lond. part 1, p. 65 (1902); Ris, Cat. Coll. Selys, fasc. xiii, pp. 553, 580, 581 (1911); Laidlaw, Rec. Ind. Mus. vol. viii, p. 338 (1914); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, pp. 507, 509, 510 (1919); id., J. Siam. Soc. Nat. Hist. vol. iii, no. 4, p. 458 (1919); id., Rec. Ind. Mus. vol. xxv pp. 426, 438 (1924); id., J. Siam. Soc., Nat. Hist. Suppl. vol. vii, p. 85 (1927); Laidlaw, J. F.M.S. Mus. vol. xvi, p. 225 (1930); Fraser, Rec. Ind. Mus. vol. xxxiii, p. 446 (1931); id., J. Siam. Soc., Nat. Hist. Suppl. vol. ix, p. 133 (1933).
- Neurothemis sophronia* var. *sumatrana* Kruger, Stett. Ent. Zeit. vol. lxiv, p. 285 (1903).

Male.—Abdomen 21–26 mm. Hind-wing 27–32 mm.

Head: labium creamy-yellow; labrum bright ochreous; rest of face, frons, vesicle, and occiput reddish-brown; eyes dark reddish-brown above, golden-brown below. *Prothorax*, *thorax*, and *abdomen* uniform reddish-brown, sutures and borders of latter finely black. *Legs* and *anal appendages* dark ferruginous. *Wings* opaque dark reddish-brown except for an irregular triangular area at apices of wings which is clear and uncoloured; this area meeting border of wing posteriorly, but bordered with dark brown superimposed on amber-yellow narrowly outwards and costalwards; margin of dark area beginning slightly nearer proximal end of pterostigma and running straight backwards in fore-wing, obliquely basalwards in hind-wing, but with very irregular crenate margin, the dark area presenting clear amber-tinted areas in costal and basal spaces, base of hypertrigones, space distal to arc, and at node and subnode; the whole of the dark area very finely and closely reticulated by bright yellow nervures except in the clear spaces. Nodal index $\frac{18-32}{24-26} \mid \frac{32-17}{25-23}$; antenodals and postnodals adjacent the node breaking up into a network of secondary neurulation; 10 cubital nervures



in fore-wing, 6 in the hind ; pterostigma dark reddish-brown ; membrane blackish-brown. *Genitalia* as for genus.

Female.—Abdomen 20–24 mm. Hind-wing 26–32 mm.

Many forms of the female are found, varying from complete isochromes to several different types of heterochromes. Isochromatic forms vary only by having the apex of fore-wing completely clear and that of hind-wing bordered with amber-yellow but not opaque brown ; the crenate border of the dark area also runs straight back to posterior border of wing in both fore- and hind-wings or, in the latter, may even extend apicalwards at this point. The typical heterochromatic forms have the ground-colour of head, thorax, and body generally much paler or ochreous, with some dark brown clouding at apical halves of segments 3 to 7. *Wings* clear amber-yellow with a dark ray in the subcostal space which encroaches on the costal space near the node and extends posteriorwards at the same level to form a large quadrate nodal spot ; after a short clear postnodal area there is again some brown clouding at the costa ; basal half of hind-wing more or less heavily clouded with dark blackish-brown at border which sends an extension anteriorwards over distal half of anal loop and following its outline. Between these two forms many others exist with clear, uncoloured apical areas in fore-wings or both wings, similar to the male. A rare form is found in which the typical heterochrome combines with the isochrome to form a dark form in which the apical windows are clear amber-yellow instead of uncoloured, the distal border of the dark area being very diffuse. *Genitalia* of female typical of genus.

Distribution.—Throughout INDIA in wet and semi-wet areas, but not so far reported from Ceylon. Also distributed throughout BURMA, Malacca, and Siam, and Indo-China up to altitudes of 3,000 ft. This species occurs in large colonies at the borders of jungle and usually in low-lying swampy country, but I have found it in considerable numbers in the Deccan and it was a common insect in the Horticultural Gardens, Poona, where it apparently bred in the Moolah Canal or pools in the neighbouring Byrobah Nullah. As a rule it breeds in weedy ponds or marshes, the latter being preferred. The clear uncoloured apices of wings will serve to distinguish it from other Indian species, and the female equally well by the uniform golden-amber tint of the ground-colour of the wings, with or without clear apex in fore-wing. Specimens of both sexes in most national collections, as well as in the British, Indian, and Pusa Museums. I possess a fine series of females ranging from extreme heterochromes to extreme isochromes, the latter being common in Malabar and Siam.

The *type* has been lost.

489. *Neurothemis fluctuans* (Fabricius).

- Libellula fluctuans* Fabricius, Ent. Syst. vol. ii, p. 379 (1793);
Burmeister, Handb. Ent. vol. ii, p. 853 (1839); Calvert, Trans.
Amer. Ent. Soc. vol. xxv, p. 71 (1898).
Polyneura elegans Rambur, Ins. Névro. p. 127 (1842).
Polyneura apicalis Brauer, Novara, p. 104 (1866).
Neurothemis ceylanica Brauer, Verh. zool.-bot. Ges. Wien, vol. xvii,
p. 11 (1867); Kirby, J. Linn. Soc., Zool. vol. xxiv, p. 550
(1893).
Neurothemis nicobarica Brauer, Verh. zool.-bot. Ges. Wien,
vol. xvii, p. 12 (1867); id., ibid. vol. xviii, p. 717 (1868).
Neurothemis palliata Hagen, Stett. Ent. Zeit. vol. xxx, p. 100
(1869).
Neurothemis fluctuans Hagen, Stett. Ent. Zeit. vol. xxx, p. 105
(1869); Selys, Ann. Mus. Civ. Genova, vol. xiv, pp. 290, 295
(1879); Albarda, Veths. Midd. Sumatra, Neur. p. 3 (1881);
Selys, Ann. Mus. Civ. Genova, vol. xxvii, p. 453 (1889); id.,
ibid. vol. xxx, p. 446 (1891); Kirby, Cat. Odon. p. 7
(1890); Karsch, Ent. Nach. vol. xvii, p. 45 (1891); id., Mitt.
Mus. Senckenberg, vol. xxv, p. 219 (1900); Laidlaw, Proc.
Zool. Soc. Lond. part 1, p. 65 (1902); Kruger, Stett. Ent. Zeit.
vol. lxiii, p. 125 (1902); id., ibid. vol. lxiv, p. 260 (1903);
Martin, Mission Pavie, Zool. p. 5 (sep.) (1904); Ris, Cat.
Coll. Selys, fasc. xiii, pp. 552, 566-569 (1911); Fraser,
J. Bombay Nat. Hist. Soc. vol. xxvi, p. 513 (1919); id., J. Nat.
Hist. Soc. Siam, vol. iii, p. 458 (1919); id., ibid. vol. vii, p. 85
(1927); Laidlaw, J. F.M.S. Mus. vol. xvi, pp. 225, 240 (1930);
Fraser, J. Siam. Soc., Nat. Hist. Suppl. vol. ix, p. 134 (1933).

Male.—Abdomen 17-22 mm. Hind-wing 20-25 mm.

Head: labium creamy-yellow or pale brownish; labrum ochreous; face, frons, and vesicle olivaceous, often tinged with ferruginous above; occiput and superior surface of eyes reddish-brown, yellow or olivaceous below. *Prothorax* and *thorax* uniform reddish-brown. *Legs* yellowish or ferruginous, with black spines. *Wings* dark reddish-brown from base to proximal end of pterostigma, slightly variable in extent, overlapping proximal end of pterostigma by a few cells or falling short of this level by the same distance; outer border of dark area in fore-wing running straight back to posterior border of wing but, in the hind-wing, strongly curved inwards so that a clear area is left along posterior border of wing which may extend proximalwards to as far as the apex of anal loop. Costal space proximal to node pale, subcostal space much darker, basal space pale, cubital space a little darker; pterostigma dark reddish-brown; membrane dark brown. Nodal

index $\frac{10-13\frac{1}{2}}{10-11} \mid \frac{13\frac{1}{2}-9}{9-11}$; basal reticulation dense. *Abdomen* reddish-brown, with a diffuse blackish-brown elongate stripe on the sides of segments 2 to 9 near the ventral border.

Female.—Abdomen 18-22 mm. Hind-wing 22-28 mm.



Both isochromatic and heterochromatic forms occur, the latter being far the most common. *Heterochromatic forms*: head and body similar to male but much paler; abdomen olivaceous or ochreous, with similar dark, elongate, ventro-lateral spots on segments 2 to 9 as in the male, but darker and much better defined. *Wings* hyaline, with a diffusely limited pale amber-yellow marking at base of wings extending distalwards as far as discoidal cell or beyond; usually costal space as far as pterostigma and subcostal space as far as node tinted with yellow; apices of all wings diffusely pale brown to as far proximal as outer or inner end of pterostigma, which latter is reddish-brown as in the male. Neuration in this form very open in contrast to the male; 3 cubital nervures only in all wings, discoidal cells traversed only once; hyper-trigones twice in fore-wing, once in the hind; 3 rows of cells at beginning of discoidal field; nodal index $\frac{9-11\frac{1}{2}}{9-9} \mid \frac{11\frac{1}{2}-8}{9-9}$.

Isochromatic forms: body coloured and marked as in heterochromes or darker reddish-brown; *wings* similar to the male or with the dark area of less extent. (In one female in my collection the area is golden-amber from base to within one cell of pterostigma, and the whole of the centre of the same area, except for a narrow diffuse margin, is opaque reddish-brown as far proximal as level of discoidal cell and anal loop.) In the male a similar form is rarely met with, and in this, as in the female, the basal dark area of the wing is free from accessory dense neuration. In the typical male the neuration in the basal area of wings, discoidal cells, discoidal field, and anal loop is filled with a dense and close reticulation which is absent in the females, even in isochromatic ones. *Genitalia* as for genus.

Distribution.—BURMA, Malacca, Sumatra, Java, and Borneo. (Brauer's mention of Ceylon as a locality for this species is an error.) I have specimens also from Siam, where this insect appears to be common. This species, although very variable in size and markings, the latter also depending on the age of individuals, is easily determined by the dark area of the hind-wing curving away towards the base of wing, leaving a narrow clear margin to wing posteriorly. The only species which may be confused with it is *N. degener*, in which occasional examples have the wing darkly coloured as in *fluctuans*, but the posterior border is very narrowly hyaline and the dark area less evenly curved.

The *type*, a male, indicated from E. India, is in the Lund Museum; examples of both sexes in all national collections, including the British, Indian, and Pusa Museums.

490. *Neurothemis intermedia intermedia* (Rambur).

- Libellula intermedia* Rambur, Ins. Névro. p. 91 (1842)
Trithemis intermedia Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, p. 736 (1868).
Neurothemis intermedia Selys, Ann. Mus. Civ. Genova, vol. xxvii, p. 454 (1889); Kirby, Cat. Odon. p. 8 (1890); id., J. Linn. Soc., Zool. vol. xxiv, p. 550 (1893); Kruger, Stett. Ent. Zeit. vol. lxiv, p. 256 (1903); Martin, Mission Pavie, Zool. p. 5 (sep.) (1904); Laidlaw, Rec. Ind. Mus. vol. viii, p. 337 (1914).
Neurothemis intermedia intermedia Ris, Cat. Coll. Selys, fasc. xiii, pp. 551, 563, 564 (1911); id., ibid. fasc. xvi, p. 1168 (1916); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, pp. 511, 512 (1919); id., J. Nat. Hist. Soc. Siam, vol. iii, p. 458 (1919); id., Rec. Ind. Mus. vol. xxvi, pp. 426, 437, 438 (1924); id., ibid. vol. xxxiii, p. 446 (1931).

Male.—Abdomen 22–24 mm. Hind-wing 24–27 mm.

Head: labium, bases of mandibles, labrum, face, and frons pale yellow, the former often creamy-white, the latter often olivaceous; vesicle olivaceous; occiput and upper surface of eyes reddish-brown, eyes below golden-yellow. *Prothorax* reddish-brown; *thorax* pale greenish-yellow, dorsum tinged with ferruginous and with a distinct humeral reddish-brown stripe, well defined on inner side, diffuse at outer border and darkening below. *Wings* hyaline, very palely tinted with yellow, and with a broad basal amber-yellow marking at base of all wings, extending distally to as far as discoidal cell or two or three cells beyond that level; costal and subcostal spaces also tinted with yellow to as far as pterostigma, which is dark ochreous

between dark brown nervures. Nodal index $\frac{12-12\frac{1}{2}}{11-9} \mid \frac{11\frac{1}{2}-11}{9-11}$,

$\frac{10-11\frac{1}{2}}{10-10} \mid \frac{11\frac{1}{2}-10}{10-9}$; 3 or 4 cubital nervures in fore-wing,

2 in the hind; discoidal cells traversed only once, as also hypertrigones; subtrigones in fore-wing 3-celled; discoidal field beginning with rows of 3 cells; neurulation generally rather open. *Abdomen* bright reddish-ochreous with sutures on segments 2 and 3 finely darker and a more or less well-defined ventro-lateral brownish stripe interrupted at apical end of segments 3 to 8; some small dark points at base of segment 10. *Anal appendages* reddish, of the usual *Libelluline* shape. *Genitalia* as for genus.

Female.—Abdomen 21–24 mm. Hind-wing 25–28 mm.

Resembles the male in colour and markings of body, but the ventro-lateral stripe on abdomen usually much more sharply defined. *Wings* uniformly tinted with pale yellow, this diffusely deepened along costal area; basal marking of male entirely absent. (No isochromatic forms known.) *Genitalia* similar to *N. fluctuans*, but vulvar scales not projecting so prominently, sloping at an angle analwards.

Distribution.—Throughout PENINSULAR INDIA, CEYLON, and BURMA and extending into Malacca and Indo-China. No great variability is found except in the extent of the basal marking and the depth of colouring of this latter; in some, especially those from dry areas like the Deccan, this marking is very pale and almost imperceptible, whilst in those from moist areas it becomes a deeper amber tint. The limited nature of the basal marking of wings will determine this species from all others save *N. intermedia atalanta*, in which this marking is much more sharply defined and in which the costal area is not tinted with yellow. The marking in adults is also darkly enfumed.

The *type*, labelled as from Bombay, but probably from Poona or Mahableshwar, Bombay Presidency, is in the Brussels Museum collection.

491. *Neurothemis intermedia atalanta* Ris.

Neurothemis intermedia atalanta Ris, Cat. Coll. Selys, fasc. xvi, p. 1168 (1916); Fraser, Rec. Ind. Mus. vol. xxvi, p. 438 (1924).

Neurothemis intermedia intermedia Fraser (pars), Rec. Ind. Mus. vol. xxvi, pp. 437, 438 (1924).

Closely resembles the last species; differs as follows:—Labrum and frons and often whole of face brightly tinted with crimson; occiput bright ferruginous; dorsum of *thorax* uniform olivaceous to dark reddish-brown and without humeral stripe; *abdomen* with ventro-lateral stripe much broader, often continuous along whole length of abdomen; segments 8 and 9 often with mid-dorsal carina blackish and 9 often entirely black save ventral border; segment 10 broadly black at base. *Wings* with basal marking an intense golden-amber colour which in old adults becomes darker with dark opaque brownish, especially towards outer border of marking, which in some extends two-thirds of the way towards node from base; nodal index variable, but generally similar to that of *N. intermedia intermedia*. *Genitalia* similar to latter species.

Female.—Abdomen 19–21 mm. Hind-wing 22–27 mm.

Resembles the female of *N. intermedia intermedia*, but the costal yellow stripe usually absent or but very faintly defined. Humeral stripe absent; dorsum of thorax darker olivaceous; markings of abdomen, as in the male, more extensive and darker coloured. Vulvar scale as in *N. fluctuans*.

Distribution.—Similar to that of *N. intermedia intermedia*. The type is from Nongpoh, ASSAM. I have specimens from Nakachari, SIBSAGAR, and N. Dihong, ASSAM; Manjeri and



Palghat, S. MALABAR; Devrashola, NILGIRI WYNAAD; Shandong, SIKKIM; Mergui, BURMA; and Lat Bua Kao, Siam. On the whole, specimens are much smaller than *N. intermedia intermedia*, and have the markings, save the humeral stripe, which is absent, much broader and better defined and the basal marking of wing much brighter or darkly enfumed with brownish.

The type is in Mr. Morton's collection.

492. *Neurothemis intermedia degener* Selys.

Neurothemis degener Selys, Ann. Mus. Civ. Genova, vol. xiv, pp. 290, 296 (1879).

Neurothemis intermedia Selys, Ann. Mus. Civ. Genova, vol. xxx, p. 446 (1889).

Neurothemis ? septentrionis Förster, Insektenborse, vol. xxi, p. 358 (ex Ris) (1904).

Neurothemis intermedia degener Ris, Cat. Coll. Selys, fasc. xiii, pp. 552, 564, 565 (1911); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, pp. 508, 512 (1919); Laidlaw, Rec. Ind. Mus. vol. viii, pp. 337, 338 (1914).

Male.—Abdomen 23–25 mm. Hind-wing 26–28 mm.

Coloured similarly to *N. intermedia intermedia*, but without the humeral stripe on thorax and with the ventro-lateral interrupted stripe either absent or very poorly defined. *Wings* hyaline, tinted with golden-yellow from base to within one or two cells of pterostigma, but the colour continued in the costal space right up to pterostigma. In the fore-wing this coloured area with a straight border, in the hind sloping obliquely towards posterior border of wing, which in some specimens has this border one cell-breadth free of colour. In others this area with the border in fore-wing oblique from costal to posterior border and rather irregular; in very old adults this area blackish-brown and with the costal space as far as node, basal and hypertrigonal spaces, and space immediately posterior to subcostal space hyaline. *Genitalia* very similar to *N. intermedia intermedia*.

Female.—Abdomen 24–25 mm. Hind-wing 28–29 mm.

Rather more palely coloured than the male; ventral border of abdomen and mid-dorsal carina finely black, the latter rather broadly black on segments 8 and 9; ventro-lateral stripe present, but very poorly defined. *Wings* hyaline, apices of all tinted with yellow and enfumed palely with brown, gradually fading away towards proximal end of pterostigma; costal border from slightly proximal to node to pterostigma tinted with yellow, rather intensely so shortly distal to node. Nodal index and venational details in both sexes approximating to that of *N. intermedia intermedia*. Vulvar scale rather

shorter than in the latter insect. Only heteromorphic females known.

Distribution.—BENGAL, ASSAM, SIKKIM, and BURMA. This subspecies resembles a teneral *N. fluctuans* in which the dark area of the wing has not assumed its rich blackish-brown, but this area in the hind-wing of *intermedia degener* runs at first straight back to the posterior border and then, near that level, takes a rather abrupt turn towards the base of wing; in *N. fluctuans*, this area is regularly curved from the costal border fanwise towards the base.

The *type* in the Brussels Museum; Selys's type and specimens are from Caragola, Meetan, Teinzo, Palone, and Bhamo, Burma; a female in the British Museum from Ataran, Burma; specimens in the Author's collection from Maymyo, Burma, Jalpaiguri District, Bengal; specimens in the Indian Museum from Dejoon and Dibrugarh, Assam.

493. *Neurothemis tullia tullia* (Drury).

Libellula tullia Drury, Ill. Exot. Ins. vol. ii, pl. xlv, fig. 3, p. 85 (1773).

Libellula equestris Fabricius, Spec. Ins. vol. i, p. 523 (1781); id., Ent. Syst. p. 379 (1793); Burmeister, Handb. Ent. vol. ii, p. 855 (1839); Rambur, Ins. Névrois. p. 79 (1842); Hagen, Stett. Ent. Zeit. vol. x, p. 175 (1849); id., Verh. zool.-bot. Ges. Wien, vol. viii, p. 480 (1858); Calvert, Trans. Amer. Ent. Soc. vol. xxv, p. 77 (1898).

Libellula lineata Fabricius, Ent. Syst. vol. ii, p. 375 (1793); Rambur, Ins. Névrois. p. 73 (1842).

Diplax equestris Brauer, Novara, p. 104 (1866).

Neurothemis equestris Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, p. 718 (1868); Selys, Ann. Mus. Civ. Genova, vol. xiv, pp. 290, 297 (1879); id., ibid. vol. xxx, p. 447 (1891); Kruger, Stett. Ent. Zeit. vol. lxiv, p. 257 (1903); Martin, Mission Pavie, Zool. p. 5 (sep.) (1904).

Neurothemis tullia Kirby, Cat. Odon. p. 8 (1890); id., J. Linn. Soc., Zool. vol. xxiv, p. 550 (1893); id., Ann. Mag. Nat. Hist. (6) vol. xiv, p. 112 (1894); id., ibid. (7) vol. v, p. 531 (1900); Laidlaw, Proc. Zool. Soc. Lond. part 1, p. 66 (1902); Kirby, Ann. Mag. Nat. Hist. (7) vol. xv, p. 271 (1905); Laidlaw, Rec. Ind. Mus. vol. viii, p. 337 (1914); id., J. F.M.S. Mus. vol. xvi, p. 225 (1930).

Neurothemis tullia feralis Ris, Cat. Coll. Selys, fasc. xiii, pp. 551, 561, 562 (1911); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, pp. 507, 510, 511 (1919); id., J. Nat. Hist. Soc. Siam, vol. iii, p. 458 (1919); id., Rec. Ind. Mus. vol. xxvi, pp. 428, 437 (1924); id., J. Siam. Soc., Nat. Hist. Suppl. vol. vii, p. 85 (1927); id., Rec. Ind. Mus. vol. xxxii, p. 446 (1931).

Male.—Abdomen 16–20 mm. Hind-wing 19–23 mm.

Head: labium blackish-brown, middle lobe and borders of lateral lobes paler brown; labrum, face, frons, vesicle, and occiput black; eyes blackish-brown above, violaceous below. *Pro-*



thorax, thorax, and *abdomen* black, mid-dorsal carina of thorax narrowly yellow; a broad mid-dorsal interrupted creamy-white stripe on segments 1 to 8, broad at base of segments, tapering to apical end and becoming lost on segment 7 or 8. *Legs* black, tibiae yellow on extensor surfaces. *Wings* hyaline for apical half, opaque steely blue-black for basal half, the border of this opaque area running in both fore- and hind-wings from costal border, one cell distal to node in fore-wing, two or three cells distal in hind, to the posterior border of wings in a convex curve; a broad opalescent white band bordering the black area in both wings, broad at costal border, tapering to posterior border, but not quite attaining to it; nodal index $7-10\frac{1}{2}$ | $10\frac{1}{2}-8$
 $8-10$ | $10-8$. Pterostigma dull ochreous bordered with black; membrane black. *Anal appendages* creamy-white tipped with black, of the usual Libelluline shape: superiors with a row of minute black teeth below. *Genitalia* as for genus.

Teneral males with body coloured as in the female and with wing-markings warm brown and two darker rays in subcostal space and space between sectors of arc; many varieties of this marking are met with, according to age of individuals.

Female.—Abdomen 16–19 mm. Hind-wing 20–23 mm.

Differs markedly from the male both in body-colouring and markings and in marking of wings (the old authors, deceived by the broad differences, described the two sexes as two different species). *Head*: labium creamy-white; labrum, face, and frons pale olivaceous- or greenish-yellow; vesicle olivaceous-brown; occiput olivaceous, with a bright citron-yellow geminate spot behind; eyes pale brown above, pale olivaceous laterally and beneath. *Prothorax* and *thorax* greenish-yellow, with a bright yellow stripe extending from anterior lobe of former to mid-dorsal carina and antealar sinus of latter; this stripe broadly bordered with blackish-brown throughout; antero-lateral suture and upper part of postero-lateral finely black. *Legs* carneous, yellow on extensor surface, black on flexor surface of tibiae and distal ends of femora. *Wings* coloured and marked as follows:—Base of wings, to as far as two or three cells distal of node, bright amber-yellow; subcostal space from base of wing to node blackish-brown, broadening at node into a very large blackish-brown spot which traverses wings nearly to posterior border, variably round, oval or triangular in shape in fore-wing, irregular or curved like a sickle in the hind; apices of all wings broadly opaque blackish-brown to as far proximal as middle or inner end of pterostigma; the area between these two opaque areas with pale yellow neuration, including costa,



and almost invisible. *Abdomen* bright yellow, with a broad black stripe extending from segment 1 to the end, black beneath, the two black areas confluent at segment 7 or 8 to enclose a narrow yellow stripe which tapers from base of abdomen to segment 7, the black stripes expanding at apical ends of segments so as to constrict the dorsal yellow and, finally, by confluence over dorsum, to enclose yellow spots on segments 8 and 9; segment 10 and the short conical *anal appendages* bright yellow. Vulvar scales and ninth ventral plate of equal length, projecting prominently posteriorwards. (Many variations of wing-pattern are met with, according to age of individual specimens.)

Distribution.—From the WEST COAST OF INDIA and CEYLON, throughout PENINSULAR INDIA in the plains, BURMA, Malacca, Indo-China, and Hong-kong. There is no difficulty in distinguishing this subspecies from others of the same genus; the black base of wings with opalescent white outer bordering is very characteristic, whilst, in the females, the broad black apices of wings and sickle-shaped stripe on basal half are equally diagnostic. This species occurs in large colonies in swamps or heavily-weeded tanks; it keeps closely to the shelter of the herbage and has a weak, fluttering flight. I have taken it in Bombay, Madras, Coorg, many parts of Malabar, Ceylon, and in parts of the Deccan; I have also specimens from Bengal, Burma, and Siam. Variation appears to be due to age rather than to habitat, but the latter influences size, those from Bangalore being much larger than Siamese examples.

The *type* has been lost; examples of both sexes are found in all national collections.

494. *Neurothemis tullia feralis* (Burmeister).

Libellula equestris var. *feralis* Burmeister, Handb. Ent. vol. ii, p. 855 (1839); Calvert, Trans. Amer. Ent. Soc. vol. xxv, p. 77 (1898).

Libellula communimacula Rambur, Ins. Névropt. p. 73 (1842).

Neurothemis feralis Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, p. 718 (1868); Selys, Mitt. Mus. Dresden, p. 294 (1878); id., Ann. Mus. Civ. Genova, vol. xiv, pp. 290, 298 (1879); id., ibid. vol. xxvii, p. 454 (1889); Kirby, Cat. Odon. p. 8 (1890); Kruger, Stett. Ent. Zeit. vol. lxiii, p. 125 (1902); id., ibid. vol. lxiv, p. 257 (1903); Martin, Mission Pavie, Zool. p. 5 (sep.) (1904).

Neurothemis tullia feralis Ris, Cat. Coll. Selys, fasc. xiii, pp. 551, 563 (1911); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, pp. 508, 511 (1919); id., J. Nat. Hist. Soc. Siam, vol. iii, p. 458 (1919); id., Treubia, vol. iii, p. 468 (1926); id., J. Siam. Soc., Nat. Hist. Suppl. vol. vii, p. 85 (1927); Lieftinck, Treubia, vol. xiv, p. 417 (1934).

Male.—Abdomen 17–20 mm. Hind-wing 20–24 mm.



Closely similar to *N. tullia tullia*, from which it differs by the following points :—*Male* : black basal markings of wings sloping towards base of wing from costal border, slightly convex in a few specimens, but the outer border, in most, a straight line from one or two cells distal to node to posterior border of wing at a point about six cells distal to level of apex of anal loop ; this black area without any vestige of the white opalescent band seen in *tullia tullia*. *Female* : apical marking usually much paler ; subcostal opaque stripe absent and the nodal spot much reduced or entirely absent in both or in hind-wing only ; yellow tinting at base of wing much paler ; subdorsal yellow stripe on segments 8 and 9 not usually broken up into isolated spots and the ventro-lateral yellow stripe continued to at least as far as segment 8.

Distribution.—BURMA, Indo-China, Malacca, and Sundaic Archipelago. Habits similar to those of *N. tullia tullia*. I possess specimens from Mergui, Lower Burma, and from Bangkok, Siam, where the species appears to be locally common. I have also a single male from Zibaung District, W. Salween, Burma. The differences between this subspecies and *tullia tullia* are set forth above.

The *type* appears to have been lost ; Rambur's type of *L. communimacula* is in the Brussels Museum.

Genus **BRACHYTHEMIS** Brauer. (Fig. 103.)

Brachythemis Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, pp. 367, 736 (1868) ; Kirby, Trans. Zool. Soc. Lond. vol. xii, pp. 264, 278 (1889) ; id., Cat. Odon. p. 21 (1890) ; Karsch, Berlin Ent. Zeit. vol. xxxiii, p. 357 (1890) ; Ris, Cat. Coll. Selys, fascs. ix & xiii, pp. 29, 581, 582 (1909, 1911) ; Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, pp. 737, 738 (1919).

Cacergates Kirby (pars), Trans. Zool. Soc. Lond. vol. xii, pp. 263, 306 (1889) ; Karsch, Berlin Ent. Zeit. vol. xxxiii, p. 357 (1890) ; Förster, Jber. Mannheim, vols. lxxi, lxxii, p. 9 (sep.) (1906).

Zonothrasys Karsch (pars), Stett. Ent. Zeit. vol. lxi, p. 297 (1890).
Termitophora Förster (pars), Jber. Nassau, vol. lxix, p. 305 (1906) ; id., Jber. Mannheim, vols. lxxi, lxxii, p. 9 (sep.) (1906).

Libelluline dragonflies of stout build but rather small or of medium size, coloured yellow marked with brown, and with wings partly coloured golden-yellow or blackish-brown. Head of medium size ; eyes rather broadly contiguous ; frons broadly rounded, without distinct crest ; sulcus shallow ; vesicle high, narrow, notched at apex. Prothorax with small posterior lobe ; thorax robust ; legs robust, moderately long, hind femora with a row of gradually lengthening, rather widely spaced spines. Abdomen short and broad, depressed and tapering to the end. Wings short, rather rounded at apices

reticulation close; discoidal cell in fore-wing narrow, costal side only about half the length of basal or distal, traversed; discoidal cell of hind-wing with base at arc, entire; sectors of arc very shortly fused at origin; arc situated between the first and second antenodal nervures; $6\frac{1}{2}$ or $7\frac{1}{2}$ antenodal nervures, distal one incomplete; 1 cubital nervure in all wings; *Cu*ii arising from or separated from the posterior angle of discoidal cell in hind-wing; discoidal field beginning with 3 rows of cells, its borders parallel to wing-border; no supplementary nervures to bridge; subtrigone in fore-wing 3-celled; 1 or 2 rows of cells between *IR*iii and *Rs*pl; anal loop rather broadly dilated distally and with distal side strongly angulated; pterostigma and membrane moderately

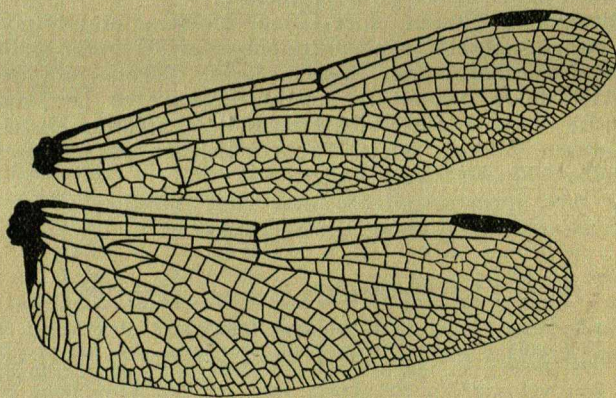


Fig. 103.—Wings of *Brachythemis contaminata* (Fabr.), male.

large. Genitalia of male: lamina small, depressed, arched; hamules small, base obtusely rounded, depressed, hooks markedly curled, directed backwards and inwards; lobe moderately large, rounded, with obtuse apex.

Genotype, *Libellula contaminata* Fabricius.

Distribution.—Ethiopian and Oriental. Only one species found within our limits. Species of this genus breed in marshes, ponds, and streams, but more particularly the latter. Some species are inclined to be crepuscular, for although they fly by day, they may be seen on the wing flying more actively towards evening and right up until darkness conceals them from sight. They hug the reedy fore-shores of streams and are rarely found away from the neighbourhood of water.

495. *Brachythemis contaminata* (Fabricius). (Fig. 103.)

Libellula contaminata Fabricius, Ent. Syst. vol. ii, p. 382 (1793); Burmeister, Handb. Ent. vol. ii, p. 859 (1839); Rambur, Ins. Névro. p. 99 (1842); Hagen, Verh. zool.-bot. Ges. Wien, vol. viii, p. 480 (1858); Brauer, Novara, p. 104 (1866); Calvert, Trans. Amer. Ent. Soc. vol. xxv, p. 91 (1898).

Libellula truncatula Rambur, Ins. Névro. p. 95 (1842).

Brachythemis contaminata Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, p. 736 (1868); Selys, An. Soc. Españ. vol. xi, p. 15 (sep.) (1882); Kirby, Trans. Zool. Soc. Lond. vol. xii, p. 279 (1889); id., Cat. Odon. p. 21 (1890); Karsch, Ent. Nachr. vol. xvii, p. 42 (1891); Selys, Ann. Mus. Civ. Genova, vol. xxx, p. 468 (1891); Kirby, J. Linn. Soc., Zool. (7) vol. xxiv, p. 551 (1893); Karsch, Mus. Senckenberg, vol. xxv, p. 219 (1900); Laidlaw, Proc. Zool. Soc. Lond. part 1, p. 67 (1902); Kruger, Stett. Ent. Zeit. vol. lxiii, p. 116 (1902); Martin, Mission Pavie, Zool. p. 5 (sep.) (1904); Kirby, Ann. Mag. Nat. Hist. (7) vol. xv, p. 271 (1905); Ris, Cat. Coll. Selys, fasc. xiii, pp. 582, 587, 588 (1911); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, pp. 738, 739 (1919); id., J. Nat. Hist. Soc. Siam, vol. iii, p. 459 (1919); id., Rec. Ind. Mus. vol. xxvi, pp. 426, 438 (1924); id., Treubia, vol. iii, p. 468 (1926); id., J. Siam. Soc., Nat. Hist. Suppl. vol. vii, pp. 85, 86 (1927); Laidlaw, J. F.M.S. Mus. vol. xvi, pp. 224, 225 (1930); Fraser, J. Siam. Soc., Nat. Hist. Suppl. vol. ix, p. 134 (1933); Lieftinck, Treubia, vol. xiv, p. 414 (1934).

Male.—Abdomen 18–21 mm. Hind-wing 20–23 mm.

Head: labium pale ochreous; labrum reddish-ochreous; face, frons, and vesicle olivaceous or pale greenish-yellow; eyes violaceous-brown above, pale olivaceous laterally and beneath; occiput brown. *Prothorax* ochreous, with dark reddish-brown stripes traversing anterior and posterior borders of middle lobe; *thorax* olivaceous-brown, ferruginous, dorsally marked with an obscure reddish-brown humeral stripe and two obscure brownish stripes on each side. *Legs* ochreous, femora dark brown or blackish on extensor surface. *Wings* hyaline, reticulation reddish, with a broad bright orange fascia extending from base to within 2 to 3 cells of pterostigma in fore-wing and as far as that organ in the hind, intensifying in colour distally, this fascia variable in extent and depth of colouring according to age, a mere pale tinting in teneral gradually deepening and extending as full adult age is reached; pterostigma rust-red, posterior border brown; membrane pale reddish-brown or carneous. *Abdomen* reddish-ochreous, marked with obscure dorsal and subdorsal brown stripes; subadult specimens approximating to colour and markings of female; segments 8 and 9 often black on mid-dorsum. *Anal appendages* ferruginous, of the usual *Libellulina* shape. *Genitalia* as for genus.

Female.—Abdomen 18–20 mm. Hind-wing 22–25 mm.

Differs from the male in colour and markings. Face pale

yellowish-white ; eyes paler brown above ; thorax pale greenish-yellow, with a narrow brown fascia running parallel to mid-dorsal carina, a dark brown stripe thickened below just internal to humeral suture, narrow blackish stripes on centres of mesepimeron and metepimeron, and an upper elongate narrow spot on former ; mid-dorsal carina and lateral sutures finely black. *Wings* hyaline, hind-wing very palely tinted with yellow at extreme base, but the bright orange fascia seen in the male absent ; pterostigma bright ochreous between dark nervures ; venation similar in the sexes—nodal index $\frac{6-7\frac{1}{2}}{5-6} \mid \frac{7\frac{1}{2}-6}{6-5}$; discoidal field beginning with a row of 3 cells and continued as such or for a short distance as rows of 2 cells ; only 1 row of cells between *IRiii* and *Rspl*, but occasionally a few doubled cells. *Legs* similar to male. *Abdomen* pale olivaceous-brown, with a narrow black stripe on mid-dorsal carina extending from segment 2 to end and broadening on segments 8 and 9 ; a subdorsal interrupted dark brown stripe on segments 2 to 6, the space between this and the dark mid-dorsal carina bright pale yellow ; all sutures and ventral border finely black. *Anal appendages* yellow, brown at apices, rather long, conical, acuminate at apex ; vulvar scales two short triangular plates overlapping ninth segment.

Distribution.—Throughout the plains of INDIA, CEYLON, and BURMA ; extending east to China, Formosa, and the Philippines, and southwards to Java and Sumatra. A very common insect, found everywhere both along the borders of streams, especially sluggish ones, and also over weedy tanks and lakes. It literally swarms along the banks of the Coomb River in Madras, and may be seen there in great numbers on the wing till after dark.

The *type* has been lost ; examples of both sexes found in all national and well-known collections.

Genus **RHODOTHEMIS** Ris. (Fig. 104.)

Rhodothemis Ris, Cat. Coll. Selys, fascs. ix. & xiii, pp. 29, 591, 592, (1909, 1911) ; Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, p. 504 (1919).

A monotypic genus of the Libellulinae whose sole species is characterized by its rather large size and homogeneous scarlet-red colouring, which closely resembles that of *Crocotthemis servilia* and *erythræa* and the red species of *Orthetrum*. Head relatively small, eyes meeting only at a point ; occiput correspondingly very large ; frons with deep narrow sulcus dividing it into two horseshoe-shaped surfaces anteriorly ;

vesicle high, apex with two sharp points. Prothorax with large posterior lobe, emarginate, forming two rounded lobes which are heavily fringed with long hairs; thorax robust; legs long and very robust; hind femora with 8 small, very closely-set spines at base followed by 5 or 6 gradually lengthening very robust spines at distal end; mid-femora very similar; tibial spines very robust. Abdomen slightly dilated dorso-ventrally at base, then triquetral in section and tapered very gradually to the end. Wings long and moderately broad, reticulation rather close; discoidal cell in fore-wing narrow, its costal side less than half the length of distal or basal side, traversed; that of hind-wing with base at level of arc, entire; sectors of arc with a long fusion in fore-wings and hind;

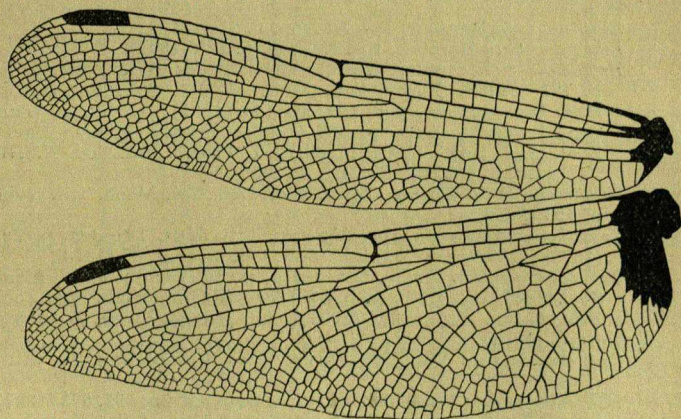


Fig. 104.—Wings of *Rhodothemis rufa* (Rambur), male.

arc situated between first and second antenodal nervures; $10\frac{1}{2}$ to $12\frac{1}{2}$ antenodal nervures, distal one incomplete; 1 cubital nervure in all wings; *Cu*ii widely separated from the posterior angle of discoidal cell in hind-wing; discoidal field beginning with a row of 3 cells, then continued as rows of 2 cells for a distance of 5 to 7 cells or to level of bridge, its sides widely dilated at posterior border of wing no supplementary nervures to bridge; subtrigone in fore-wing 3-celled; 1 row of cells between *IR*iii and *Rs*pl; anal loop widely dilated at distal end and with distal side strongly angulated; membrane large; pterostigma of moderate length. Genitalia: lamina depressed, arched; hamules small, base narrow and right-angled, hooks of the same length, nearly straight, projecting out and posteriorwards; lobe very narrow, rounded at apex.

Anal appendages : superiors rather long, spined beneath nearly to base, nearly straight ; inferior short and obtuse at apex. Female with borders of segment 8 not dilated ; vulvar scale about half as long as segment 9, projecting, rounded at apex.

Genotype, *Libellula rufa* Rambur.

Distribution.—From WESTERN INDIA, CEYLON, and BURMA and southwards to the Sundaic Archipelago and Australia. The sole species known breeds in small, weedy tanks, the larva, which has the abdomen curiously black, living in floating weed. The imagines never wander far from their watery habitat, and are usually found along the banks of tanks and lakes or hiding up in surrounding scrub-jungle.

496. *Rhodothemis rufa* (Rambur). (Fig. 104.)

- Libellula rufa* Rambur, Ins. Névro. p. 71 (1842).
Libellula oblita Rambur, Ins. Névro. p. 123 (1842).
Erythemis rufa Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, p. 723 (1868) ; Kirby, Cat. Odon. p. 40 (1890) ; Selys, Ann. Mus. Civ. Genova, vol. xxx, p. 448 (1891) ; Kirby, J. Linn. Soc., Zool. vol. xxiv, p. 556 (1893) ; Martin, Mission Pavie, Zool. p. 7 (sep.) (1904) ; Tillyard, Proc. Linn. Soc. N.S.W. vol. xxxi, p. 483, pl. xlv. fig. 3 (1906).
Erythemis oblita Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, p. 723 (1868).
Crocothemis cruentata Hagen-Selys, Mitt. Mus. Dresden, p. 294 (1878) ; Förster, Wien. Ent. Zeit. vol. xxix, p. 55 (1910).
Orthetrum oblitum Kirby, Cat. Odon. p. 36 (1890) ; id., J. Linn. Soc., Zool. vol. xxiv, p. 554 (1893) ; Martin, Mem. Soc. Zool. France, vol. xix, p. 224 (1901) ; id., Mission Pavie, Zool. p. 7 (sep.) (1904).
Crocothemis rufa Van Der Weele, Nova Guinea, vol. ix, p. 22 (1900).
Rhodothemis rufa Ris, Cat. Coll. Selys, fasc. xiii, pp. 592, 593 (1911) ; id., ibid. fasc. xiv, p. 1172 (1916) ; Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, p. 505 (1919) ; id., Rec. Ind. Mus. vol. xxvi, pp. 426, 438 (1924) ; Laidlaw, J. F.M.S. Mus. vol. xvi, pp. 226, 240 (1930) ; Fraser, Rec. Ind. Mus. vol. xxxiii, p. 446 (1931) ; Lieftinck, Treubia, vol. xiv, p. 418 (1934).
Crocothemis servilia servilia var. *maxima* Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, p. 517 (1919).

Male.—Abdomen 25–29 mm. Hind-wing 32–37 mm.

Head : labium reddish-brown ; labrum and anteclypeus reddish-ochreous ; postclypeus, frons, and vesicle blood-red ; occiput reddish-brown ; eyes bright scarlet, capped above with brown. *Prothorax* and *thorax* reddish-brown without markings ; abdomen and anal appendages brilliant scarlet-red. *Wings* hyaline, with a dark amber-yellow spot at base of wings extending half-way to first antenodal nervure in fore-wing and as far as first antenodal nervure, slightly distal to cubital nervure, and invading base of anal loop in hind-wing ; pterostigma bright ochreous between black nervures ; costa and



basal neuration reddish. *Anal appendages* and *genitalia* as for genus.

Female.—Abdomen 25–29 mm. Hind-wing 32–37 mm.

Differs from the male in the following respects :—*Labrum*, anteclypeus, and lower part of postclypeus ochreous ; upper part of postclypeus blackish-brown, this extending upwards to crest of frons, beyond which, and above frons, is bright citron-yellow bordered finely with dark brown at base ; eyes reddish-brown above, olivaceous below ; occiput bright citron-yellow. *Prothorax* dark brown with a mid-dorsal citron-yellow stripe ; thorax golden-brown laterally, blackish-brown dorsally, with a bright citron-yellow stripe extending from front of dorsum backwards between the roots of wings, this stripe split into two elongate narrowly triangular antehumeral stripes by the dark brown mid-dorsal carina. *Legs* as in male, dark reddish-brown. *Wings* similar to male, but basal marking less extensive ; venation, as in male, that of genus. *Abdomen* dark golden-brown, with a bright citron-yellow stripe on mid-dorsum of segments 1 to 4, and represented on segments 5 to 8 or 9 by a pair of small dorsal basal spots ; sutures and ventral border all finely black. *Anal appendages* shortly conical, brownish-yellow. *Genitalia* as for genus. (It will be seen that the citron-yellow stripe begins on the frons and is continued in a more or less interrupted way across head, prothorax, and thorax on to abdomen.)

Distribution.—Extends from the WEST COAST of INDIA and CEYLON throughout INDIA, BURMA, and Malaysia to New Guinea, Celebes, Borneo, Java, and Australia. I found it common around Bombay and in the foothills of the Nilgiris and Coorg. It is usually found hawking around weedy tanks or settled on herbage in the vicinity thereof. The female will be found in neighbouring jungle, and is easily recognized by the greenish-yellow stripe, which forms a continuous line from occiput to well on to abdomen. The male is not so easily recognized on the wing, as it closely resembles large specimens of *Orthetrum chrysis* or of *Crocothemis servilia* and *Urothemis signata*. It is better to take all red specimens seen, in the hope of taking *R. rufa* ; the very short contiguity of the eyes, the discoidal field beginning with a row of 3 cells and then continued on as rows of 2 cells, and the very characteristic armature of the legs will serve to determine this species from those mentioned.

The *type*, a male in the Brussels Museum collection, is said to have come from Java ; specimens of both sexes are found in most national collections and in the Pusa Museum collection.

Genus **SYMPETRUM** Newman. (Fig. 105.)

Sympetrum Newman, Ent. Mag. vol. i, p. 511 (1833); Kirby, Trans. Zool. Soc. Lond. vol. xii, pp. 263, 276 (1889); Karsch, Ent. Zeit. Berlin, vol. xxxiii, p. 357 (1890); Kirby, Cat. Odon. pp. 13, 178 (1890); Williamson, Rep. Geol. Indiana, vol. xxiv, pp. 250, 321 (1900); Lucas, British Dragonflies, p. 57 (1900); Needham, Bull. N.Y. State, vol. xlvii, p. 520 (1901); Calvert, Biol. C. Amer., Neur. pp. 204, 320 (1905-1907); Ris, Jenaische Denks. vol. xiii, p. 329 (1908); id., Cat. Coll. Selys, fascs. ix & xiii, pp. 30, 616-624 (1909, 1911); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, pp. 494, 495 (1919); Needham, Zool. Sinica, ser. A, vol. xi, pp. 158, 159 (1930).

Diplax Charpentier, Lib. Eur. p. 12 (1840); Hagen, Syn. Neur. N. Amer. p. 173 (1861); Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, pp. 369, 719 (1868); Selys, Ann. Soc. Ent. Belg. vol. xxviii, p. 29 (1884); Calvert, Trans. Amer. Ent. Soc. vol. xx, p. 224 (1893); id., Proc. Calif. Acad. (2) vol. iv, pp. 472, 544 (1895); Kellicott, Odon. Ohio, pp. 92, 107 (1899); Ris, Mitt. Schweitz. Ent. Ges. vol. x, p. 439 (1903).

Thecadiplax Selys (pars), Ann. Soc. Ent. Belg. vol. xxvii, p. 139 (1883); id., ibid. vol. xxviii, p. 38 (1884); Kirby, Trans. Zool. Soc. Lond. vol. xii, pp. 264, 277 (1889).

Libelluline dragonflies of rather small or moderate size, of rather homogeneous appearance, usually coloured yellow or

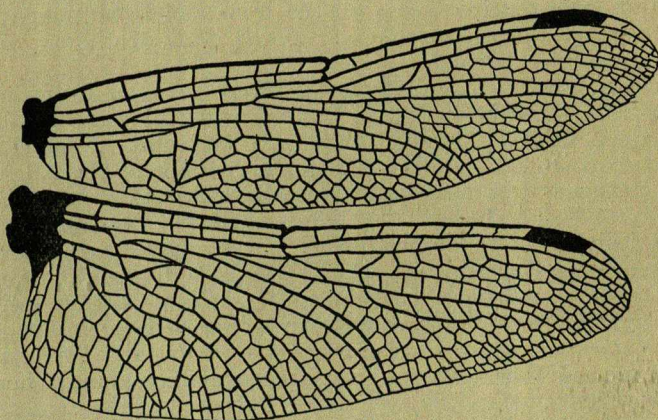


Fig. 105.—Wings of *Sympetrum striolatum* (Charpentier), male.

reddish with more or less restricted black markings, and with uncoloured wings or with base marked with yellow. Head small or medium-sized; eyes moderately contiguous; frons rather prominent, but without a well-defined crest, sulcus shallow; vesicle rather small, very slightly notched above. Prothorax with very large posterior lobe fringed with long



hairs ; thorax moderately robust ; legs long and rather slim ; hind femora with a row of numerous, very small spines and with some longer ones at distal end. Abdomen slim or narrowly fusiform towards the anal end, cylindrical or triquetral in section, segment 8 not dilated laterally in the female. Genitalia : that of male variable in the species ; that of female also rather variable. Wings relatively short and broad, reticulation rather open ; discoidal cell in fore-wing narrow, its apex sloping towards base of wing, costal side not more than half the length of basal, traversed ; that of hind-wing base at the arc, entire or rarely traversed ; sectors of arc with shortly fused in fore-wing, with a longer fusion in the hind ; arc lying between the first and second antenodal nervures ; $7\frac{1}{2}$ to $9\frac{1}{2}$ antenodal nervures, distal one incomplete ; 1 cubital nervure in all wings ; *Cuii* arising from the posterior angle of discoidal cell in hind-wing ; discoidal field with 3 rows of cells nearly throughout, its sides converging strongly at wing-border ; no supplementary nervures to bridge ; 1 or 2 rows of cells between *IRiii* and *Rspl* ; anal loop dilated at distal end, its distal side strongly angulated ; pterostigma usually small ; membrane moderately large.

Genotype, *Libellula vulgata* Linn.

Key to Indian Species of Sympetrum.

- | | | |
|----|---|--|
| 1. | { Upper or flexor surfaces of femora and tibiae yellow 2. | |
| | { Legs entirely black or only anterior femora yellow on inner side 4. | |
| 2. | { Base of hind-wing with poorly defined yellow marking ; legs entirely yellow or broadly so on flexor surface ; a poorly defined black basal line to frons above. 3. | |
| | { Base of hind-wing with well-defined yellow marking ; legs black with a fine yellow line on flexor surface ; a well-defined black basal line to frons above..... | [p. 377.
<i>fonscolombei</i> (Selys), |
| 3. | { General colouring pale sandy-yellow ; abdomen pale rust-red above ; thorax unmarked ; legs entirely yellow..... | [p. 380.
<i>decoloratum</i> (Selys), |
| | { General colouring reddish-ochreous ; abdomen and thorax reddish, the latter with a diffuse greenish antehumeral stripe ; legs yellow above, flexor surface black..... | [p. 376.
<i>meridionale</i> (Selys), |
| 4. | { Only $6\frac{1}{2}$ to $7\frac{1}{2}$ antenodal nervures to fore-wing 5. | [p. 372.
<i>commixtum</i> (Selys), |
| | { At least $8\frac{1}{2}$ to $10\frac{1}{2}$ antenodal nervures to fore-wing 5. | |



5. { Basal reticulation of wings red; thorax blood-red without lateral yellow markings [p. 379.
 hæmatoneura Fraser,
6. { Basal reticulation black; thorax reddish with sides broadly marked with yellow. 6.
6. { Black markings on thorax broad; yellow markings on sides extending to wings; anterior femora yellow on inner side .. [p. 373.
 hypomelas (Selys),
6. { Black markings on thorax narrow; lateral yellow markings confined to lower part of sides of thorax; anterior femora entirely black [p. 375.
 orientale (Selys),

497. *Sympetrum commixtum* (Selys). (Fig. 107, a.)

Diplax commixta Selys, Ann. Soc. Ent. Belg. vol. xxviii, p. 38 (1884).

Sympetrum subpruinosa Kirby, Proc. Zool. Soc. Lond. p. 326, pl. xxxiii, fig. 7 (1886); id., Cat. Odon. p. 14 (1890).

Sympetrum commixtum Kirby, Cat. Odon. p. 16 (1890); Morton, Trans. Ent. Soc. Lond. p. 304 (1907); Ris, Cat. Coll. Selys, fasc. xiii, pp. 621, 634, 635 (1911); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, pp. 495, 498 (1919).

Male.—Abdomen 28–30 mm. Hind-wing 31–33 mm.

Head: labium yellow, with middle lobe often black or partly so; labrum, postclypeus, and anterior surface of frons bright ochreous; anteclypeus and sides of face pale olivaceous; frons above olivaceous, narrowly bordered with black against the eyes; eyes reddish-brown above, olivaceous laterally and below; vesicle brown. *Prothorax* yellow, black between anterior and middle lobes and sides of latter; *thorax* dark olivaceous on dorsum, suffused with ferruginous, laterally bright citron-yellow in subadults, changing to dull olivaceous in upper part in full adult age; humeral and postero-lateral sutures narrowly black, as well as a short lower stripe over spiracle; beneath black, traversed by a broad bright yellow stripe. *Legs* entirely black. *Wings* hyaline, with extreme bases tinted with amber-yellow, deepest in sub-costal and cubital spaces; nodal index $\frac{6-7\frac{1}{2}}{6-5}$ | $\frac{7\frac{1}{2}-6}{5-6}$; ptero-

stigma ferruginous above, pale ochreous beneath; membrane pale yellow, large. *Abdomen* red above, black beneath, this latter slightly overlapping ventral border, especially on segments 9 and 10, and rather broadly so on 9; base of segments 1 and 2 and base of mid-dorsal carina on segments 8 and 9 narrowly black. *Anal appendages* red, tipped with black. *Genitalia* as in fig. 107, a.

Female.—Abdomen 30 mm. Hind-wing 32 mm.

Resembles the male closely, but generally paler coloured; face and frons pale yellow; abdomen ochreous, with darker

sutures, the black beneath extending more broadly on to sides and, in addition, a subdorsal black stripe extending from segments 3 to 9, almost obsolete on segments 3 to 4 or 5, then broadening, especially towards apical end of each segment, and incomplete at base. *Wings* similar to male; nodal

index $\frac{7-6\frac{1}{2}}{7-5} \mid \frac{6\frac{1}{2}-6}{5-7}$. *Anal appendages* shortly conical, yellow.

Genitalia: vulvar scale short, sloping posteriorwards, arched and narrow; ventral plate on segment 9 tumid and furnished with two tiny hooks near base.

Distribution.—A rare or local insect. It has been reported from N. and N.W. INDIA only. Morton has reported it from Deesa (Col. Nurse's specimens). I have specimens from Abbotabad and from Yusimarg, Kashmir, the latter collected by Mr. Bainbrigge Fletcher during August. The legs and underside of abdomen, together with the shape of the male genitalia, will serve to determine this species from the two following.

The *type* is in the Brussels Museum; Kirby's type of *S. subpruinoseum* is in the British Museum.

498. *Sympetrum hypomelas* (Selys). (Fig. 106, c.)

Diplax hypomelas Selys, Ann. Soc. Ent. Belg. vol. xxviii, p. 37 (1884); id., Ann. Mus. Civ. Genova, vol. xxx, p. 448 (1891).

Sympetrum hypomelas Kirby, Cat. Odon. p. 16 (1890); Ris, Cat. Coll. Selys, fasc. xiii, pp. 621, 659, 660 (1911); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, pp. 495, 498, 499 (1919).

Male.—Abdomen 25–26 mm. Hind-wing 29–32 mm.

Head: labium palest brown or dirty yellow, middle lobe

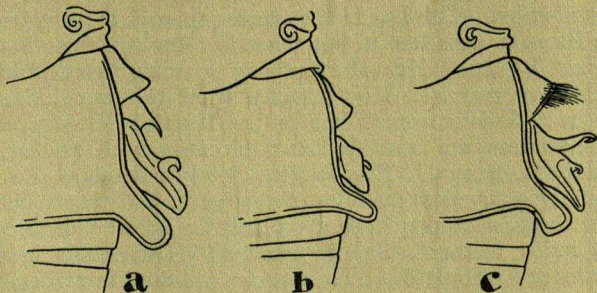


Fig. 106.—Male genitalia of (a) *Sympetrum orientale* (Selys); (b) *Sympetrum fonscolombei* (Selys); (c) *Sympetrum hypomelas* (Selys).

and borders of lateral lobes black; labrum, face, frons, and vesicle suffused with bright red, olivaceous at sides of face and



anteclypeus; no basal black line to frons; occiput and upper surface of eyes reddish-brown. *Prothorax* black, with anterior lobe and middle of mid-lobe bright yellow and posterior lobe dull yellow. *Thorax* golden-brown on dorsum, with a broad black humeral stripe which is bordered inwardly with warm reddish-brown; laterally two broad bright citron-yellow stripes separated by a broad black stripe on postero-lateral suture; beneath black, this confluent with stripe on sides and sending up a short stripe on to spiracle and another which fuses with humeral stripe. *Legs* black, but inner sides of base of anterior pair of femora bright yellow. *Wings* hyaline, with extreme bases amber-yellow as in *S. commixtum*; pterostigma short, dark reddish-brown between black nervures; nodal index $\frac{10-9\frac{1}{2}}{10-7} \mid \frac{9\frac{1}{2}-9}{7-9} \mid \frac{9-9\frac{1}{2}}{9-8} \mid \frac{8\frac{1}{2}-9}{7-9}$. *Abdomen* bright reddish-

ochreous above, black beneath, this colour overlapping on to sides from segments 2, 3, or 4 and very broadly so from segments 6 to 10. *Anal appendages* reddish-ochreous at base, black for apical half. For *genitalia* see fig. 106, c.

Female.—Abdomen 25–27 mm. Hind-wing 31–35 mm.

Closely resembling the male, differs only in markings of abdomen, where is an additional subdorsal broad black stripe extending from base of segment 2 to segment 7, where it becomes confluent with the black of underside; on segments 3 to 5 this stripe, together with the black overlapping from below, cuts off a narrow yellow stripe, and on segment 6 encloses a narrow elongate basal spot. *Anal appendages* black, shortly conical; vulvar scale very short, not projecting, minutely emarginate; ventral plate of segment 9 tumid, strongly keeled, and broadly overlapping segment 10.

Distribution.—This handsome species appears to be restricted to N. BENGAL and ASSAM, but there is a doubtful female from Copabo, BURMA. Mr. Morton has a male from Sikkim, and I have several of both sexes from the same locality. There is a female from Tibet in the Brussels Museum. My own specimens are from Soching, Sikkim, and Kurseong and Gopaldhara, Bengal. This species closely resembles the last, but the bright yellow on sides of thorax extends up to base of wings, the anal appendages are black for apical half and the nodal index is much higher, usually $9\frac{1}{2}$ antenodals in fore-wing instead of only $6\frac{1}{2}$. This species is found in rather open country settling on bare patches of ground or bracken.

The *type* is in the Selys collection, Brussels Museum.

499. *Sympetrum orientale* (Selys). (Fig. 106, a.)

Diplax orientale Selys, Ann. Soc. Ent. Belg. vol. xxvii, p. 140 (1883); id., ibid. vol. xxviii, p. 37 (1884).

Sympetrum orientale Kirby, Cat. Odon. p. 16 (1890); Ris, Cat. Coll. Selys, fasc. xiii, pp. 621, 661, 662 (1911); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, pp. 495, 499 (1919).

Male.—Abdomen 24–26 mm. Hind-wing 29–33 mm.

Head: labium reddish-brown, middle lobe black; labrum ochreous to dull scarlet-red at borders; face and frons bright ochreous tinged with scarlet, especially at upper part of latter; vesicle scarlet-red; occiput reddish-brown; eyes reddish-brown above, paler laterally and beneath. *Prothorax* bright reddish-ochreous, base of anterior lobe and a large spot on sides of middle lobe black; *thorax* ferruginous, brighter red on dorsum, and with humeral and lateral narrow black stripes or lines. *Legs* black. *Wings* palely enfumed and with a bright amber marking at base, rather variable in extent, in fore-wing from base to half-way to cubital nervure and first antenodal nervure or right up to these structures, in hind-wing, extending to cubital nervure or as far as discoidal cell and arc; membrane reddish-brown; pterostigma dark reddish-brown between black nervures; nodal index $\frac{9-8\frac{1}{2}}{9-7} \mid \frac{9\frac{1}{2}-9}{7-10}$,

$\frac{8-9\frac{1}{2}}{8-7} \mid \frac{9\frac{1}{2}-8}{7-9}$. *Abdomen* scarlet-red on dorsum, black beneath,

the black overlapping the sides on the end segments. (In some specimens segments 3 to 7 have elongate red spots beneath, thus differing from type.) *Anal appendages* scarlet-red, of the usual Libelluline shape. For *genitalia* see fig. 106, a.

Female.—Abdomen 23–24 mm. Hind-wing 27–29 mm.

Closely resembles the male; face bright ochreous without reddish tinting; sides of thorax bright chrome-yellow, dorsum with a diffused greenish antehumeral stripe on an olivaceous background and bordered inwardly with dark brown; humeral stripe bordered with dark reddish-brown rather broadly on inner side; abdomen with a black interrupted subdorsal stripe on segments 2 to 9, the area between which and ventral border bright ochreous, dorsum dull golden-brown, sutures finely black. *Wings* similar to male. *Anal appendages* short, yellow; vulvar scales very similar to last species.

Distribution.—Known only from the Khasia Hills, ASSAM. This species varies somewhat in size and markings; it closely resembles *S. hypomelas*, but differs from that species by the sides of thorax a dull red instead of bright yellow and the black markings more restricted. The genitalia differ in several important respects and are the best guides for differentiation.

Type, a male, in the Selys collection, Brussels Museum; examples in the Pusa Museum collection and the Author's.

500. *Sympetrum meridionale* (Selys). (Fig. 107, b.)

Libellula meridionalis Selys, Rev. Zool. p. 245 (1841); id., Bull. Acad. Brux. vol. x, p. 4 (sep.) (1843); id., Rev. Odon. pp. 39, 383 (1850), etc.

Libellula hybrida Rambur, Ins. Névropt. p. 191 (1842).

Libellula meridionalis var. *nudicollis* Hagen, Rev. Odon. p. 40 (1850); Kirby, Cat. Odon. p. 179 (1890).

Diplax meridionalis Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, p. 720 (1868); Pirota, Ann. Mus. Civ. Genova, vol. xiv, p. 435 (1879); Brauer, Verh. zool.-bot. Ges. Wien, vol. xxx, p. 229 (1880); Selys, Ann. Soc. Ent. Belg. vol. xxviii, p. 36 (1884); etc.

Sympetrum meridionale Meyer-Dür, Mitt. Schweiz Ent. Ges. vol. iv, p. 326 (1874); Kirby, Cat. Odon. p. 15 (1890); Calvert, Proc. Acad. Phil. p. 154 (1898); Ris, Cat. Coll. Selys, fasc. xiii, pp. 618, 635-637 (1911) (for full list of references prior to this year consult this last).

Male.—Abdomen 24-26 mm. Hind-wing 28-30 mm.

Head: labium pale reddish; labrum, face, and anterior surface of frons bright chrome-yellow to bright reddish,

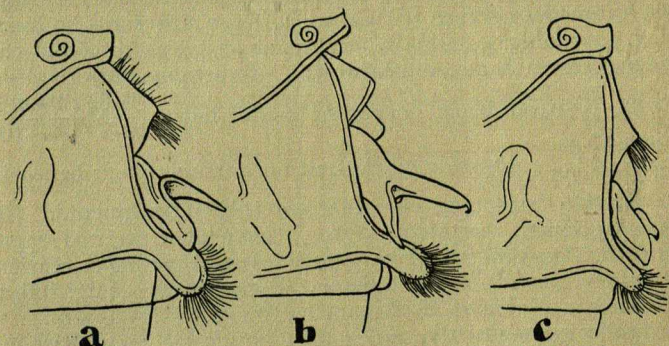


Fig. 107.—Male genitalia of (a) *Sympetrum commixtum* (Selys); (b) *Sympetrum meridionale* (Selys); (c) *Sympetrum decoloratum* (Selys).

olivaceous laterally, upper surface of frons pale brownish-red and with a very narrow basal black line incomplete laterally; vesicle olivaceous, tipped with red or bright yellow; occiput and upper surface of eyes reddish-brown, olivaceous beneath. *Prothorax* olivaceous, anterior border of middle lobe and a large spot on each side black; *thorax* olivaceous or reddish-brown, tinted with rose-red laterally according to age of specimens, dorsum with a narrow brownish antehumeral stripe, mid-dorsal region brownish, and the area between this and antehumeral stripe olivaceous; humeral and postero-lateral sutures very finely black, that on humeral suture usually interrupted at places. *Legs* black on flexor surface, bright yellow on external and extensor surfaces. *Wings* hyaline, but enfumed in old adults and with vestigial yellow basal



markings; pterostigma reddish-brown between thick black nervures; membrane white; nodal index $\frac{6-7\frac{1}{2}}{8-5} \mid \frac{6\frac{1}{2}-6}{5-7}$,

$\frac{7-7\frac{1}{2}}{7-5} \mid \frac{7\frac{1}{2}-7}{5-7}$. *Abdomen* yellow to brilliant red on dorsum, according to age; all segments with paired yellow subapical points and fine yellow articulations; segment 1 broadly black at base; segment 2 narrowly blackish-brown at base; beneath olivaceous or reddish, spotted with black on each segment. *Anal appendages* red, tipped with black at extreme apex, of the usual Libelluline shape. *Genitalia* as in fig. 107, b.

Female.—Abdomen 25–26 mm. Hind-wing 29–30 mm.

Closely resembles the male by its restricted markings, but ground-colour paler, more golden-brown or ochreous than reddish; the pale greenish-white antehumeral stripe more distinct, but the bordering one less so; interrupted black stripes on sides obsolete; black markings on prothorax better defined; *abdomen* with ventral borders finely black; a reddish-brown subdorsal stripe extending from base of abdomen nearly to end; segments 8 and 9 with small basal black spots; segment 10 with base finely black; whole of abdomen beneath pulverulent-white in old specimens. *Wings* similar to male, but tinted with yellow in subcostal, cubital, and anal triangular spaces. *Anal appendages* ferruginous, shortly conical; vulvar scale projecting markedly at right angles to plane of abdomen, scoop-shaped; ninth ventral plate arched and extending back over segment 10.

Distribution.—Throughout S. Europe, N. Africa, and extending through Asia Minor to Persia and KASHMIR. I have both sexes from Yusimarg, 7,500 ft., and from below Gulmarg, 8,000 ft., Kashmir, taken by Mr. Bainbrigge Fletcher. The species varies to some extent, the above description having been made from Kashmir specimens. The only species found within Indian limits with which it can be confounded is *S. decoloratum*, a much smaller, less robust species, with colour uniformly sandy-yellow in tint and without dorsal markings to thorax.

The *type* appears to have been lost; examples are found in all European national museums.

501. *Sympetrum fonscolombei* (Selys). (Fig. 106, b.)

- Libellula flaveola* (nom. prec.) Fonscolombe, Ann. Soc. Ent. France, vol. vi, p. 144 (1837).
Libellula fonscolombei Selys, Mon. Lib. Eur. pp. 29, 49, 208 (1840); id., Bull. Acad. Brux. (7) vol. i, p. 4 (sep.) (1840); Rambur, Ins. Névro. p. 102 (1842); Selys, Rev. Odon. pp. 57, 383 (1850), etc.
Libellula erythroneura Schneider, Stett. Ent. Zeit. vol. vi, p. 111 (1845).

Diplax fonscolombe Brauer, Novara, p. 104 (1866); id., Verh. zool.-bot. Ges. Wien, vol. xviii, p. 720 (1868); id., ibid. vol. xxx, p. 229 (1880); Selys, Ann. Soc. Ent. Belg. vol. xxviii, p. 34 (1884); id., ibid. vol. xxxii, p. 135 (1888); etc.

Sympetrum fonscolombe Meyer-Dür, Mitt. Schweiz Ent. Ges. vol. iv, p. 327 (1874); Kirby, Proc. Zool. Soc. Lond. p. 326 (1886); Calvert, Proc. Acad. Phil. p. 154 (1898); Morton, Trans. Ent. Soc. Lond. p. 303 (1907); Ris, Cat. Coll. Selys, fasc. xiii, pp. 619, 637-640 (1911) (for full list of references prior to this date consult this last); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, pp. 495, 497, 498 (1919); id., Rec. Ind. Mus. vol. xxvi, pp. 426, 438, 439 (1924); id., ibid. vol. xxxiii, p. 446 (1931).

Sympetrum rheticum Buchecker, Syst. Ent. p. 9, pl. vii, fig. 2 (1876).

Sympetrum fonscolombii Kirby, Cat. Odon. p. 14 (1890).

Male.—Abdomen 22-28 mm. Hind-wing 24-29 mm.

Head: labium reddish-brown, middle lobe black; labrum, face, and frons cherry-red, sides of face pale yellow; vesicle olivaceous tipped with red; eyes brown above, red at sides, and pale olivaceous-yellow below; occiput olivaceous-brown; a narrow black line at base of frons. *Prothorax* black, a small spot on each side of middle lobe and the whole of posterior lobe reddish. *Thorax* coated with yellowish hair, very long and dense on dorsum; golden-brown or reddish-brown, with a narrow bluish-white stripe on posterior half of mesepimeron and again on posterior half of metepimeron; mid-dorsal carina in its upper half, a broadly broken line on humeral suture, a broader line just in front of spiracle, incomplete above and a fine line on postero-lateral suture all black; beneath olivaceous, traversed by black. *Legs* black, extensor surfaces of femora and tibiæ bright yellow. *Wings* with costal border and reticulation proximal to node red; extreme bases of wings touched with amber-yellow; pterostigma bright ochreous between thick black nervures; nodal index $6-7\frac{1}{2}$ | $6\frac{1}{2}-6$; membrane reddish-brown, attached border $6-5$ | $5-6$; white. *Abdomen* blood-red, with base of segment 2, a broad spot on dorsum of segment 1, dorsum of segments 8 and 9 broadly, and the whole of ventral border finely black; on segments 8 and 9 this black border broadens widely to enclose a spot of the ground-colour at base of segment 8; beneath black, with large medial triangular spots on segments 6 to 9. *Anal appendages* long and slim, broadened near base, bright red. For *genitalia* see fig. 106, b.

Female.—Abdomen 23-28 mm. Hind-wing 27-30 mm.

Very similar to the male; differs as follows:—Red colouring replaced everywhere by ochreous; face pale yellow; dorsum of thorax with pale brown antehumeral stripe incomplete above; *abdomen* dark ochreous above, brighter yellow at sides along ventral border, which is more broadly black;

a subdorsal black stripe extending from segment 3 to base of 10, incomplete between base of segment and jugal suture on segments 3 to 7, the black on ventral border extending finely up to meet this stripe and again at apical ends of segments, especially on segments 7 to 9, where the stripe is broken up into elongate spots. *Wings* similar to male, but basal marking of greater extent, especially in hind-wing; venational details similar to male; pterostigma bright yellow between thick black nervures. *Anal appendages* short, chrome-yellow; vulvar scale short, usually not projecting, but markedly so in some specimens.

Distribution.—Within our limits this species is found in the N.W. PROVINCES, KASHMIR, and on the tops of all the southern hills, being especially common in the NILGIRIS, PALNIS, and TRAVANCORE hills above 5,000 ft. It is found all the year round in the Nilgiris, but during the months of November to March only females are seen, and these hiding up in bracken and woods, apparently hibernating. The species has been recorded over a very wide area extending from the British Isles, across Europe, over the whole of Africa in temperate areas, and middle Asia to as far east as Kashmir. It breeds in ponds and marshes, and I have frequently observed it ovipositing in the lakes at Ootacamund and Sims Park, Coonoor, Nilgiris.

Type in the Selys collection, Brussels Museum; examples in all national collections.

502. *Sympetrum hæmatoneura* Fraser.

Sympetrum hæmatoneura Fraser, Mem. Dept. Agric. India (Ent.), vol. viii, pp. 70, 71 (1934).

Male.—Abdomen 26 mm. Hind-wing 31 mm.

Head: labium ochreous, middle lobe black; labrum, face, and frons, as also upper part of eyes, blood-red; vesicle and occiput dark yellowish-brown. *Prothorax* brown; *thorax* blood-red, marked with a narrow black humeral stripe and a broad similarly coloured stripe lying between the lateral sutures; beneath black. *Legs* entirely black. *Wings* hyaline, reticulation red as far distal as node, black beyond; pterostigma black or dark reddish-brown; only 1 row of cells

between *IR_{iii}* and *Rs_{pl}*; nodal index $\frac{9-8\frac{1}{2}}{9-6} \mid \frac{8\frac{1}{2}-9}{7-10}$. *Abdomen*

blood-red above, black beneath, with the apical and inner borders of pleurites and the whole of under-surface of segment 10 red. *Genitalia*: hamules with base and hook of equal length; lobe long, narrow, rounded at apex.

Female unknown.

Distribution.—KASHMIR.



The *type* is from Nilnag, 6,900 ft., and was taken in August and is now in the British Museum collection. It closely resembles *S. hypomelas* and is nearly related to it; it differs by the wing reticulation, by its lower nodal index, and by the presence of red markings beneath the abdomen.

503. *Sympetrum decoloratum* (Selys). (Fig. 107, c.)

Diplax vulgata race *decolorata* Selys, Ann. Soc. Ent. Ent. Belg. vol. xxviii, p. 35 (1884).

Sympetrum vulgatum race *decoloratum* Selys, Ann. Soc. Ent. Belg. vol. xxxi, p. 10 (1887); Kirby, Cat. Odon. p. 15 (1890).

Sympetrum decolorata Morton, Trans. Ent. Soc. Lond. p. 303 (1907).

Sympetrum sp. ? Bartenev, Odonat. Kars. Exc. p. 6 (sep.) (1909).

Sympetrum decoloratum Ris, Cat. Coll. Selys, fasc. xiii, pp. 618, 629-631, figs. 363, 364 (1911); id., ibid. fasc. xvi, p. 1176 (1916); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, pp. 495, 497 (1919); Morton, Ent. Month. Mag. (3) vol. v, pp. 190-192 (1919); id., Ann. Mag. Nat. Hist. (9) vol. v, p. 301 (1920); id., Ent. Month. Mag. (3) vol. vi, p. 87 (1920).

Male.—Abdomen 21-25 mm. Hind-wing 23-27 mm.

Head: labium and labrum pale creamy-white; face, frons, and vesicle pale bluish-white or olivaceous and sometimes with a pale flush of red at summit of frons, which has a small black point at its centre in front of vesicle; eyes reddish-brown above, greenish-yellow below. *Prothorax* pale sandy-yellow, with a broad black band between anterior and middle lobes and a mid-dorsal line on posterior lobe. *Thorax* pale sandy- or greenish-yellow, with antealar sinus, upper part of humeral suture, and postero-lateral suture very finely outlined in black; dorsum with a pale antehumeral brown stripe incomplete above, often very obscure; beneath yellowish-white. *Legs* yellow, with flexor surfaces of femora and tibiae more or less black. *Wings* hyaline, very colourless, reticulation mostly pale yellow; pterostigma carneous between black nervures; membrane dirty white; nodal index $6-6\frac{1}{2}$ | $6\frac{1}{2}-6$. *Abdomen* sandy-yellow, dorsum flushed with $6-5$ | $5-6$. *Abdomen* sandy-yellow, dorsum flushed with ferruginous, especially towards anal segments, segments 2 to 9 each with a tiny reddish dot on each side of dorsal carina at apical end; a black medial stripe beneath abdomen. *Anal appendages* pale yellow, rather long and slim. For *genitalia* see fig. 107, c.

Female.—Abdomen 23 mm. Hind-wing 26 mm.

Resembles the male in most details of colouring and markings except the abdomen, on which the reddish flush on dorsum is often absent, and by the presence of an obscure subdorsal interrupted blackish stripe on each side extending from segment 3 to the end and also a fine black ventral border to

same segments. Vulvar scale variable, short and inconspicuous in Indian forms, not projecting. *Anal appendage* short, sandy-yellow.

Distribution.—N. Africa, Egypt, Persia, Mesopotamia, and N.W. INDIA. I have specimens from Suez, Basra and Amara, and Persia. Mr. Morton has specimens of both sexes from Quetta, this being the only record of the species within our limits. There is no difficulty in distinguishing this species from all others of the genus by its pale sandy colouring without markings and by its small size and very slender build.

The *type* is in the Selys collection, Brussels Museum; examples in the British Museum collection, Mr. Morton's, and the Author's.

Genus **TRITHEMIS** Brauer. (Fig. 108.)

Trithemis Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, p. 176 (1868); id., *ibid.* pp. 366, 735 (1868); Kirby, Trans. Zool. Soc. Lond. vol. xii, pp. 264, 277 (1889); Karsch, Berlin Ent. Zeit. vol. xxxiii, p. 357 (1890); Kirby, Cat. Odon. p. 18 (1890); Ris, Ent. News, vol. xiv, p. 218 (1903); Needham, Proc. U.S. Nat. Mus. vol. xxvi, pl. 1, fig. 1 (1903); Förster, Jber. Mannheim, vols. lxxi, lxxii, p. 12 (sep.) (1906); Ris, Cat. Coll. Selys, fascs. ix. & xiv, pp. 33, 757-762 (1909-1912); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, pp. 919, 920 (1920). *Stoechia* Kirby (pars), Ann. Mag. Nat. Hist. (7) vol. ii, p. 235 (1898).

Libelluline dragonflies of medium size, variable in colour and shape. Head small or of average size; eyes moderately contiguous; frons variable, with or without a distinct crest,

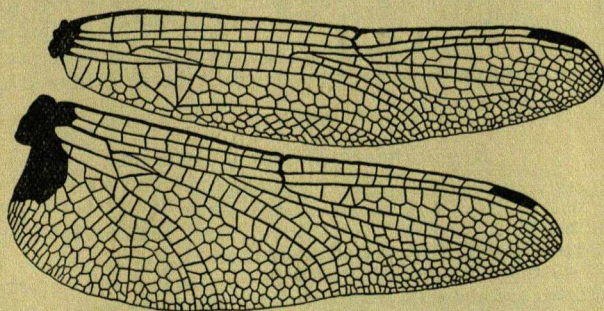


Fig. 108.—Wings of *Trithemis festiva* (Rambur), male.

always rounded in the female, sulcus shallow or deep; vesicle broad, depressed. Prothorax with a small posterior lobe, not fringed with hairs; thorax rather narrow; legs variable, moderately long and robust or (in *T. pallidinervis*) very long and slim; hind femora with a row of very closely-set small



spines and a single, much longer one at distal end; that of female with less numerous, more openly-set, gradually lengthening spines (in *T. pallidinervis* similar to male); abdomen variable in the species; wings long and relatively broad, reticulation usually close (more open in *T. pallidinervis*); discoidal cell of fore-wing narrow, costal side about half the length of proximal, traversed; that of hind-wing with base at level of arc, entire; subtrigone of fore-wing 3-celled; sectors of arc with a long fusion at origin; arc situated between the first and second antenodal nervures; $8\frac{1}{2}$ to $15\frac{1}{2}$ antenodal nervures in fore-wing, distal one incomplete; 1 cubital nervure in all wings (occasionally 2 in hind-wing of *T. kirbyi*); *Cu*i arising from the posterior angle of discoidal cell in hind-wing, rarely from distal side of cell; discoidal field beginning with 3 rows of cells, its borders strongly convergent at wing-border in fore-wing; no supplementary nervures to bridge; 2 rows of cells between *IR*iii and *R*spl; anal loop dilated distally, usually a short space with 2 rows of cells distal to its midrib (only 1 row in *T. pallidinervis*), distal side strongly angulated; pterostigma short; membrane rather long. Genitalia variable in the species.

Genotype, *Libellula aurora* Burmeister.

Distribution.—Ethiopian and Oriental, extending to Formosa, Borneo, and the Philippines. Of this large genus four species are found within our limits, and all commonly distributed except *T. kirbyi kirbyi*, which is confined to the WEST COAST of INDIA. One species, *T. pallidinervis*, is decidedly aberrant, differing not only in some important morphological details but also strongly in its habits; it may possibly require to be placed in a genus of its own. All breed in still waters or sluggish streams, and the larvæ are to be found hiding up in masses of water-weed. Some females show a certain amount of polymorphism, this generally being confined to the colour of the wings.

Key to Indian Species of Trithemis.

- | | | | | |
|----|---|---|-------------------------------|-----------|
| 1. | { | Legs very long and spidery; pterostigma bicolorous; body yellow marked with black..... | <i>pallidinervis</i> (Kirby), | [p. 389.] |
| | | Legs of ordinary length; pterostigma unicolorous; body-colour variable..... | 2. | |
| | | Thorax and abdomen bright vermilion-red; base of hind-wing bright orange; neuriation yellow..... | <i>kirbyi kirbyi</i> Selys, | [p. 385.] |
| 2. | { | Thorax and abdomen violaceous-black; base of hind-wing with a small dark brown spot; neuriation black..... | <i>festiva</i> (Rambur), | [p. 387.] |
| | | Thorax and abdomen violaceous-crimson; base of hind-wing with small reddish-brown spot; neuriation crimson..... | <i>aurora</i> (Burmeister), | [p. 383.] |

504. *Tritheimis aurora* (Burmeister). (Fig. 109, b.)

- Libellula aurora* Burmeister, Handb. Ent. vol. ii, p. 859 (1839); Hagen, Verh. zool.-bot. Ges. Wien, vol. viii, p. 480 (1858); Calvert, Trans. Amer. Ent. Soc. vol. xxv, pl. i, fig. 8, p. 89 (1898).
- Tritheimis aurora* Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, pp. 177, 735 (1868); Selys, An. Soc. Ent. Españ. vol. xi, p. 14 (sep.) (1882); Kirby, Trans. Zool. Soc. Lond. vol. xii, p. 278 (1889); id., Cat. Odon. p. 18 (1890); Karsch, Ent. Nach. vol. xvii, p. 42 (1891); Selys, Ann. Mus. Civ. Genova, vol. xxx, p. 465 (1891); id., An. Soc. Ent. Españ. vol. xx, p. 212 (1891); Kirby, J. Linn. Soc., Zool. vol. xxiv, p. 550 (1893); id., Ann. Mag. Nat. Hist. (6) vol. xiv, p. 112 (1894); Laidlaw, Proc. Zool. Soc. Lond. part 1, p. 66 (1902); Kruger, Stett. Ent. Zeit. vol. lxiii, p. 114 (1902); Martin, Mission Pavie, Zool. p. 5 (sep.) (1904); Needham, Proc. U.S. Nat. Mus. vol. xxvii, p. 708 (1904); Kirby, Ann. Mag. Nat. Hist. (7) vol. xv, p. 271 (1905); Ris, Ann. Soc. Ent. Belg. vol. lxxv, p. 254 (1911); id., Cat. Coll. Selys, fasc. xiv, pp. 760, 775-778 (1912); Laidlaw, Rec. Ind. Mus. vol. viii, p. 338 (1914); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, pp. 920-923 (1920); id., Rec. Ind. Mus. vol. xxvi, p. 426, 439 (1924); id., J. Siam. Soc., Nat. Hist. Suppl. vol. vii, p. 86 (1927); Laidlaw, J. F.M.S. Mus. vol. xvi, pp. 226, 240 (1930); Fraser, Rec. Ind. Mus. vol. xxxiii, p. 446 (1931); Lieftinck, Treubia, vol. xiv, pp. 418, 419 (1934).
- Tritheimis soror* Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, pp. 179, 735 (1868).
- Tritheimis adelpha* Selys, Mitt. Mus. Dresden, p. 315 (1878); Albarda, Veths. Midden Sumatra, Neur. p. 4 (1881); Selys, An. Soc. Ent. Españ. vol. xi, p. 14 (sep.) (1882); id., Ann. Mus. Civ. Genova, vol. xxvii, p. 26 (1889); Kirby, Cat. Odon. p. 18 (1890); Selys, Ann. Mus. Civ. Genova, vol. xxx, p. 464 (1891); Kruger, Stett. Ent. Zeit. vol. lxiii, p. 116 (1902).
- Tritheimis fraterna* Albarda, Veths. Midden Sumatra, Neur. p. 4 (1881); Selys, Ann. Mus. Civ. Genova, vol. xxvii, p. 467 (1889).
- Tritheimis intermedia* Kirby, Proc. Zool. Soc. Lond. p. 327, pl. xxxiii (1886).
- Tritheimis congener* Kirby, Cat. Odon. p. 18 (1890).
- Tritheimis yerburyi* Kirby, Cat. Odon. p. 18 (1890); id., Proc. Zool. Soc. Lond. p. 203 (1891).
- Tritheimis liturata* Selys, Ann. Mus. Civ. Genova, vol. xxx, p. 464 (1891).

Male.—Abdomen 21-29 mm. Hind-wing 24-34 mm.

Head: labium dark ochreous, middle lobe and borders of lateral lobes broadly black; labrum dark brown, changing to black along free border; face and front of frons ochreous, changing to reddish above; vesicle and upper surface of frons metallic violaceous; occiput brown; eyes crimson above, brown laterally changing to lilaceous beneath. *Prothorax* reddish-brown, anterior lobe pale brown, anterior half of middle lobe and base of posterior lobe black. *Thorax* dull purple due to a thin pruinescence overlaying a reddish ground-colour; an obscure superior humeral brown stripe and a narrow black stripe on postero-lateral suture; finally, a short lower black line at level of spiracle; beneath olivaceous, marked with a black square with an angular black line crossing it (this

marking is found in all species of *Trithemis*, and is diagnostic of the genus). *Legs* black, tibiae and tarsi ferruginous on flexor surface. *Wings* hyaline, with crimson reticulation and a broad amber-yellow fascia at base of wings, with darker brown rays in subcostal and cubital spaces, the mark extending distally in fore-wing to first antenodal nervure and nearly to arc, and in hind-wing to second antenodal, arc and discoidal cell; pterostigma short, dark reddish-brown between black nervures; membrane blackish-brown; nodal index $10-14\frac{1}{2}$ | $13\frac{1}{2}-10$ | $9-13\frac{1}{2}$ | $12\frac{1}{2}-10$ | $12-9$ | $11-11$ | $12-10$ | $9-11$; *Riii* and *IRiii* markedly undulated; 1 cubital nervure in all wings. *Abdomen* swollen dorso-ventrally at base, then slightly constricted at segment 3 and again dilated fusiformly, depressed and rather broad; violaceous throughout, segment 9 laterally at ventral border

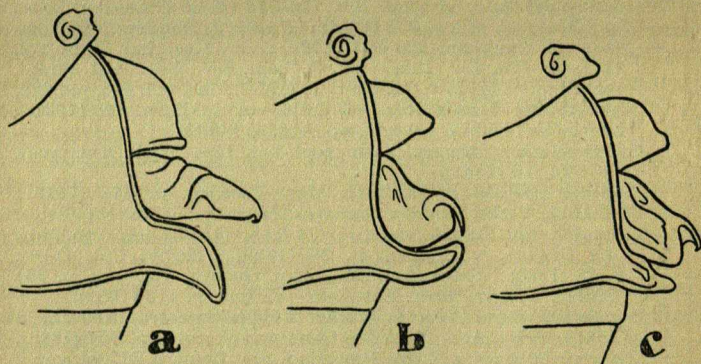


Fig. 109.—Male genitalia of (a) *Trithemis kirbyi kirbyi* Selys; (b) *Trithemis aurora* (Burmeister); (c) *Trithemis festiva* (Rambur).

and segment 10 at base marked with black. *Anal appendages* red. *Genitalia*: lamina depressed, arched; hamules with broad tumid base and short, strongly-curved hook directed backwards; lobe long, narrow, curved like a scimitar (fig. 109, b). (In teneral specimens the abdomen is very narrow and triquetral in section, bright ochreous in colour, and with the sharply-defined black spots on end segments usually absent. The wings have yellow neuration and the basal marking restricted; the thorax is yellow or olivaceous and without any pruinescence, the black markings being sharply contrasted with the pale ground-colour. It is because of these extreme differences between tenerals and adults that the species has been described under so many different names; very teneral specimens differ very broadly in colour and shape from full adults.)

Female.—Abdomen 19–27 mm. Hind-wing 24–31 mm.

Differs considerably from the male both in colour and shape.

Eyes purplish-brown above, lilaceous or grey below; occiput golden-brown to black, spotted with yellow behind; face and frons olivaceous or bright ochreous; frons yellow, with a rather broad diffuse black basal line above. *Thorax* pale olivaceous on sides, darker on dorsum, with similar black stripes as in the male, but much more sharply defined; in addition, a brownish stripe on mid-dorsal carina, a complete narrow humeral brown stripe and a short lower stripe between humeral suture and the black stripe crossing vesicle, which ascends higher up the sides than in the male. *Wings* hyaline, often broadly tipped with brown to as far as middle of pterostigma; reticulation bright yellow to brown; basal marking of similar extent, but pale and without the dark rays in subcostal and cubital spaces. *Abdomen* subcylindrical, sides parallel, ochreous, with black markings which vary in extent to almost obscuring the ground-colour; dorsal carina finely to broadly black, as also ventral borders, where the black ascends the sides at apex of each segment, the dorsal and lateral black becoming confluent on the end segments to enclose yellow spots of the ground-colour; finally, a subdorsal black stripe on segments 1 to 3, which becomes confluent with the ventral black on latter segment. *Anal appendages* black, shortly conical. Vulvar scales obsolescent; ninth ventral plate tumid, produced, and overhanging segment 10.

Distribution.—Throughout INDIA, CEYLON, and BURMA up to about 4,000 ft. Extends eastwards to as far as the Philippines and southwards to Java. The almost general violaceous colouring of the male will serve to determine it from all other species of the genus; the only other dragonfly with which it is likely to be confused is *O. pruinoseum* with the same colouring, which, however, is very much larger and has the discoidal field of fore-wing markedly dilated at wing-border and the posterior lobe of prothorax much enlarged. Indian specimens are usually on the small side, the largest specimens which I have seen are from Java and the Philippines.

The type is in the Museum of Comparative Zoology, Mass.; specimens of both sexes are found in all national collections.

505. *Trithemis kirbyi kirbyi* Selys. (Fig. 109, a.)

Trithemis aurora Kirby (pars), Proc. Zool. Soc. Lond. p. 327, pl. xxxiii, fig. 3 (1886); id., Cat. Odon. p. 18 (1890).

Trithemis kirbyi Selys, Ann. Mus. Civ. Genova, vol. xxx, p. 465 (1891); Kirby, J. Linn. Soc., Zool. vol. xxiv, p. 551 (1893); Ris, Jenaische Denks. vol. xiii, pp. 337, 338 (1908).

Trithemis kirbyi kirbyi Ris, Cat. Coll. Selys. fasc. xiv, pp. 760, 778 (1912); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, pp. 920, 923-925 (1920); id., Rec. Ind. Mus. vol. xxvi, pp. 426, 439, 440 (1924); id., ibid. vol. xxxiii, p. 446 (1931).

Male.—Abdomen 21-24 mm. Hind-wing 24-27 mm.

Head: labium, labrum, and anteclypeus pale or whitish-



yellow; frons pale yellow, usually with a bright rosy-red blush which deepens on crest and above; vesicle yellow tipped with red, surmounted by two points; occiput brown; eyes bright red above, changing gradually to lilaceous below. *Prothorax* ochreous, with a black collar between anterior and middle lobes; *thorax* olivaceous to golden-brown, tinted with rose-red on dorsal, humeral, and metepimeral areas, the mesepimeron palest olivaceous or bluish- or greenish-white; in some specimens the whole side save a narrow greenish-white stripe on mesepimeron brilliant vermilion-red; fine black points on upper parts of humeral and postero-lateral sutures and a better-defined black stripe crossing spiracle but incomplete above; beneath, the usual black square poorly defined. *Legs* carneous, extensor surface of tibiæ and femora yellowish or red, flexor surface of hind femora at distal half black. *Wings* hyaline, venuration, including costa, bright red; a broad basal bright reddish-yellow marking to all wings, rather variable and deepening in colour and extent in subcostal and cubital spaces, discoidal cell, and central portion of anal area of hind-wing; extending to third antenodal nervure and to distal end of cubital space or over whole of discoidal cell in fore-wing, and to third or fourth antenodal nervure and discoidal cell and whole of anal area as far as posterior border in the hind-wing; pterostigma black, with a narrow red stripe at its middle or this stripe palest yellow beneath; membrane dirty white; nodal index $\frac{8-10\frac{1}{2}}{9-8} \mid \frac{11\frac{1}{2}-10}{9-9}$,

$\frac{7-11}{8-8} \mid \frac{10-7}{8-8}$; discoidal cell occasionally traversed twice in fore-wing, once in the hind; occasionally 2 cubital nervures in fore-wing. *Abdomen* brilliant vermilion-red, with small basal black spots on mid-dorsum of segments 8 and 9. *Anal appendages* bright red. For *genitalia* see fig. 109, a.

Female.—Abdomen 23 mm. Hind-wing 26-30 mm.

Paler and with better-defined black markings; face pale creamy-yellow, deepening to citron-yellow on front of frons and apex of vesicle; occiput golden-yellow. *Thorax* pale greenish-white, with or without a suffusion of rose-red; an antehumeral diffuse olivaceous brown stripe parallel and adjacent to humeral suture; black markings better defined. *Wings* variable: in one form with basal marking exactly similar to male, in a second, and much more common form, this marking restricted to the extreme base of fore-wing and present only as two rays in the subcostal and cubital spaces; variations between these two forms exist but are rare. *Abdomen* ferruginous on dorsum, pale olivaceous laterally, often suffused with pink, and marked with a variable subdorsal stripe from segments 5 to 10, sometimes extending whole length of abdomen, on others nearly obsolete, and present only as

short basal spots on segments 5 to 9 ; dorsal spots on segments 8 and 9 as in the male. *Anal appendages* yellow, shortly conical. *Genitalia* : segment 8 not dilated ; vulvar scale narrowly but deeply emarginate, very short ; ventral plate on segment 9 rounded, prolonged to overlap segment 10.

Distribution.—The *type* is a male in the Selys collection, Brussels Museum, where also is a female, both simply labelled "India." Five males in the British Museum from "N. India" ; many males and several females in my own collection from Poona, Khandala, and Satara District, BOMBAY PRESIDENCY, and from Hasanur, Mysore frontier, COIMBATORE DISTRICT ; I have also two males from the Perayar River, Bolovumpatti Forest, Coimbatore District, these being the only recorded localities for this insect. I am unable to confirm Kirby's record of the species from Ceylon, and failed to find it there during my residence in the island. It is a very local insect, but moderately common where it occurs ; females are rare and are only occasionally seen, settled on bushes far from water or during their visits to water to oviposit. The males, although strikingly vivid and showy insects, have a habit of settling flat on slab rock, where they are most conspicuous ; they are, however, protected by their warning colours, and are, moreover, very swift in taking off and on the wing. Settled, they resemble large hymenopterous insects of the genus *Salix*, which they appear to mimic. This species is very seasonal, appearing quite suddenly during the months of February and March and disappearing with the advent of the S.W. monsoon.

506. *Trithemis festiva* (Rambur). (Figs. 108 & 109, c.)

Libellula festiva Rambur, Ins. Névro. p. 92 (1842).

Libellula infernalis Brauer, Verh. zool.-bot. Ges. Wien, vol. xv, p. 507 (1865).

Dythemis infernalis Brauer, Novara, pp. 98, 104 (1866) ; id., Verh. zool.-bot. Ges. Wien, vol. xvii, p. 289 (1867).

Trithemis infernalis Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, p. 736 (1868) ; Selys, Mitt. Mus. Dresden, p. 295 (1878).

Trithemis festiva Brauer, Verh. zool.-bot. Ges. Wien, p. 736 (1868) ; Selys, Ann. Mus. Civ. Genova, vol. xiv, pp. 305, 324 (1879) ; Albarda, Veths. Midden Sumatra, Neur. p. 4 (1881) ; Selys, An. Soc. Españ. vol. xi, p. 15 (sep.) (1882) ; Kirby, Proc. Zool. Soc. Lond. p. 327 (1886) ; Selys, Ann. Mus. Civ. Genova vol. xxvii, p. 466 (1889) ; Kirby, Cat. Odon. p. 19 (1890) ; Selys, Ann. Mus. Civ. Genova, vol. xxx, p. 464 (1891) ; Kirby, J. Linn. Soc., Zool. vol. xxiv, p. 551 (1893) ; id., Ann. Mag. Nat. Hist. (6) vol. xiv, p. 112 (1894) ; MacLachlan, Ann. Soc. Ent. Belg. vol. xliii, p. 301 (1899) ; Kruger, Stett. Ent. Zeit. vol. lxi, p. 113 (1902) ; Martin, Mission Pavie, Zool. p. 5 (sep.) (1904) ; Morton, Trans. Ent. Soc. Lond. p. 304 (1908) ; Martin, Ann. Mus. Civ. Genova, vol. xliii, p. 661 (1908) ; Ris, Cat. Coll. Selys, fasc. xiv, pp. 761, 762, 796-799 (1912) ; Laidlaw, Rec. Ind. Mus. vol. viii, p. 338 (1914) ; Fraser, J. Nat.

Hist. Soc. Siam, vol. iii, p. 459 (1919); id., J. Bombay Nat. Hist. Soc. vol. xxvi, pp. 920, 925, 926 (1920); id., Rec. Ind., Mus. vol. xxvi, pp. 426, 439 (1924); id., J. Siam. Soc., Nat. Hist. Suppl. vol. vii, p. 86 (1927); Laidlaw, J. F.M.S. Mus. vol. xvi, p. 227 (1930); Fraser, Rec. Ind. Mus. vol. xxxiii, p. 446 (1931); Lieftinck, Treubia, vol. xiv, p. 419 (1934).

Trihemis proserpina Selys, Mitt. Mus. Dresden, pp. 294, 314 (1878); Kirby, Cat. Odon. p. 19 (1890).

Male.—Abdomen 22–28 mm. Hind-wing 26–32 mm.

Head: labium blackish-brown; labrum dark olivaceous-brown or black with base brown; anteclypeus black; postclypeus dark olivaceous-brown; frons dark brown in front, metallic violet above, as well as vesicle; occiput dark brown; eyes dark brown above with purple reflex, bluish-grey laterally and beneath. *Prothorax* dark blue; *thorax* black, coated with a thin purplish pruinescence. *Legs* black. *Wings* hyaline, with a dark opaque brown mark at base of hind-wing, slightly variable in extent, dark rays in subcostal and cubital spaces as far as cubital nervure and extending in a curve posteriorly as far as the limit of membrane, which is dark

with paler attached border; nodal index $\frac{8-10\frac{1}{2}}{10-7} \mid \frac{10\frac{1}{2}-9}{8-10}$;

pterostigma black. *Abdomen* black, segments 1 to 3 with a thin bluish pruinescence. *Anal appendages* black, of the usual Libelluline shape. For *genitalia* see fig. 109, c. Teneral specimens coloured as for female.

Female.—Abdomen 21–24 mm. Hind-wing 24–29 mm.

Differs markedly from adult male, but very similar to teneral stages of that sex. Labium palest brown, middle lobe black; labrum, face, and frons dirty yellow, changing to dark brown on upper surface of frons, which is non-metallic; eyes dark brown above, lilaceous below. *Thorax* greenish-yellow or olivaceous, with a broad blackish-brown humeral stripe, the mid-dorsum with a broad oval dark brown stripe coming to a point at antealar sinus, an inverted Y-shaped stripe on mesepimeron and a narrow stripe on postero-lateral suture which sends a short oblique stripe backwards across metepimeron; antealar sinus and upper border of sides finely black. Beneath olivaceous with the usual black rhomboidal marking. *Legs* black, anterior femora yellow inwardly, coxæ and trochanters pale olivaceous. *Wings* similar to the male, but in adults broadly dark reddish-brown at apices to as far proximal as inner end of pterostigma; venation similar to male. *Abdomen* cylindrical and of equal width throughout (moderately broad at base and tapered very gradually to the end; very slim and triquetral in section in the male), bright yellow, marked broadly with black as follows:—A narrow mid-dorsal stripe expanding slightly at apical ends of segments and at jugal sutures,

a very narrow ventral border of black, the sutures finely black on basal segments, and lastly, a broad subdorsal stripe extending whole length of abdomen and expanding broadly at apical ends of segments to become confluent both with mid-dorsal and ventral black so as to enclose wedge-shaped spots of the ground-colour, the black becoming more predominant towards the anal segments and completely covering the terminal three. *Anal appendages* black; vulvar scale similar to last species.

Distribution.—Similar to that of *T. aurora*. Found commonly throughout the plains of INDIA, CEYLON, and BURMA; breeds in still waters or more commonly in streams with sluggish current. The male has to be distinguished from *Indothemis limbata* and *sita*, the best guide to which is the character of the venation of wings.

The *type* is a female, from Bombay, in the Selys collection, Brussels Museum. (Rambur described his type as a male, but as his description accords well with the aforementioned type he probably made an error in his diagnosis.) Mr. Morton has specimens from Quetta, which is the most northerly record of its distribution.

507. *Trithemis pallidinervis* (Kirby).

Sympetrum pallidinervis Kirby, Trans. Zool. Soc. Lond. vol. xii, p. 327 pl. lv, fig. 4 (1889).

Trithemis dryas Selys, Ann. Mus. Civ. Genova, vol. xxx, p. 465 (1891); id., An. Soc. Españ. vol. xx, p. 121 (1891).

Diplax dryas Martin, Mission Pavie, Zool. p. 5 (sep.) (1904).

Trithemis pallidinervis Morton, Trans. Ent. Soc. Lond. p. 304 (1907); Ris, Cat. Coll. Selys, fasc. xiv, pp. 761, 789-791 (1912); Laidlaw, Rec. Ind. Mus. vol. viii, p. 21 (1914); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, pp. 920, 926-928 (1920); id., Rec. Ind. Mus. vol. xxvi, pp. 426, 440 (1924); id., J. Siam. Soc., Nat. Hist. Suppl. vol. vii, p. 86 (1927); Laidlaw, J. F.M.S. Mus. vol. xvi, pp. 226, 227 (1930); Fraser, Rec. Ind. Mus. vol. xxxiii, p. 446 (1931).

Male.—Abdomen 28-32 mm. Hind-wing 30-36 mm.

Head: labium pale yellow; labrum black, with two large basal citron-yellow spots; clypeus and front of frons yellow or pale brown; upper surface of frons and vesicle metallic purple; occiput olivaceous or yellow; eyes reddish-brown above, brown laterally, and bluish-grey below. *Prothorax* dull brown or black with the anterior border of anterior lobe narrowly yellow and a large medial and a lateral spot on middle lobe. *Thorax* olivaceous-brown on dorsum and upper part of sides, brighter olivaceous on lower part of sides, dorsum thickly coated with greyish hairs; a dark brown triangle on mid-dorsum with its apex above at antealar sinus, and three

black stripes on each side, one on humeral suture, one crossing spiracle, and a posterior on postero-lateral suture; beneath, the usual black trapezoidal marking. *Legs* black, anterior pair of femora bright yellow for basal half. *Wings* hyaline, with reddish reticulation, and a bright amber-yellow basal marking at extreme base in fore-wing, but extending distally to first antenodal nervure and slightly over cubital nervure in the hind-wing, and from thence posteriorwards nearly to tornus; pterostigma black with creamy-white ends; membrane brown, with attached border white; nodal index $9-8\frac{1}{2}$ | $8\frac{1}{2}-10$. *Abdomen* long and slender, basal segments

$9-6$ | $6-10$. but slightly tumid, of nearly even width throughout; black, marked with bright yellow as follows:—The sides of segments 1 to 3 very broadly, extending well up on to dorsum on 1 and 2, but tapering to apical border on 3; long wedge-shaped spots on segments 4 to 7 and a small basal subdorsal spot on 8; remaining segments black, as well as sutures on basal segments. *Anal appendages* yellow at base, black for apical half; superiors very long and straight and with a row of robust spines on ventral border.

Female.—Abdomen 26–28 mm. Hind-wing 30–32 mm.

Resembles the male in most particulars; frons with upper surface ochreous, broadly marked at basal half with metallic or bronzed golden-green; vesicle bright yellow; *wings* similar to male, but often tinted with yellow or reddish-brown, especially towards apical half; extensor surfaces of all femora yellow; segment 10 of *abdomen* yellow, with base broadly black. *Anal appendages* rather long, conical, yellow; vulvar scale broad, very short, minutely emarginate.

Distribution.—A common insect throughout INDIA, CEYLON, and BURMA, except in desert areas; extends eastwards as far as Formosa and the Philippines, but not beyond the continent southwards. In its habits it differs widely from all other species, breeding only in stagnant waters and usually in marshy zones. The imago is generally found perched on the top of a tall reed, elevating itself by its long spidery legs, which are bunched together like a stalk. Many specimens may be seen on such perches, all facing into the wind. In its morphology it also differs from other species, the hind femora extending to end of segment 2 instead of only to end of thorax as in all other species; the armature of the hind femora is similar to other species, but differs by being the same in both sexes; the wings differ by a slightly differently shaped anal loop and the bicoloured pterostigma. Lastly, it is quite the largest species of the genus *Trithemis*. Variability does not exist and, unlike other species of the same genus, the sexes are alike. The species is found nearly all the year

round; in the dry, colder months it spreads across country far from its original watery habitats.

The *type* is in the British Museum, as also are other specimens of both sexes. Specimens are found in most national collections; both sexes are represented in my own collection from Poona, Mahableshwar, Bombay, and Khandala in Bombay Presidency; Waltair, East Coast, Madras; Calcutta; Coorg; Malabar; Colombo, Ceylon; and Bangkok, Siam.

Genus **ZYGONYX** Selys-Hagen. (Fig. 110.)

Zygonyx Selys-Hagen, Verh. zool.-bot. Ges. Wien, vol. xvii, p. 62 (1867); Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, pp. 370, 742 (1868); Selys, Syn. Cordulin. p. 83 (sep.) (1871); Karsch, Berlin, Ent. Zeit. vol. xxxiii, pp. 281, 356 (1890); Kirby, Cat. Odon. p. 184 (1890); Selys, C. R. Soc. Ent. Belg. p. cccxxviii (2. v. 1891); Calvert, Proc. Nat. Sci. Phil. pp. 245, 246 (1899); Kirby, Ann. Mag. Nat. Hist. (7) vol. v, p. 539 (1900); Förster Jber. Mannheim, vols. lxxi, lxxii, pp. 11, 19 (sep.) (1906); Ris, Cat. Coll. Selys, fascs. ix & xiv, pp. 33, 815, 816 (1909, 1912); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, pp. 740-742 (1919) id., ibid. vol. xxxi, pp. 762-769 (1926).

Pseudomacromia Kirby, Trans. Zool. Soc. Lond. vol. xii, pp. 262, 299 (1889); Karsch, Berlin Ent. Zeit. vol. xxxiii, pp. 357, 369 (1890); Kirby, Cat. Odon. pp. 34, 182 (1890); Karsch, Ent. Nach. vol. xvii, p. 73 (1891); Grunberg, Zool. Jahr. Syst. vol. xviii, p. 718 (1903); Ris, Jenaische Denks. vol. xiii, p. 341 (1908); Sjöstedt, Kilimandjaro, p. 14 (1909); Ris, Cat. Coll. Selys, fasc. xiv, pp. 800-802 (1912).

Schizonyx Karsch (pars), Berlin Ent. Zeit. vol. xxxiii, p. 281 (1890).

Schizopyga Kirby (*lapsus calami*), Cat. Odon. p. 184 (1890); Sjöstedt, Kilimandjaro, p. 15 (1909).

Schizothemis Sjöstedt, Bih. t. k. Svenska Vet.-Akad. Heidelberg, vol. xxv (4) vol. ii, p. 23 (1899); id., Kilimandjaro, p. 14 (1909).

Zygonidia Kirby, Ann. Mag. Nat. Hist. (7) vol. v, p. 533 (1900); id., ibid. vol. xv, p. 272 (1905).

Neurocena Kirby, Ann. Mag. Nat. Hist. (7) vol. v, p. 539 (1900); id., ibid. vol. xv, p. 272 (1905).

Homothemis Sjöstedt, Kilimandjaro, pp. 12, 14 (1909).

Libelluline dragonflies of large size and Corduline-like facies, coloured black marked with yellow and partly metallic. Head large; eyes broadly contiguous; frons variable, rounded or with ill-defined crest; vesicle very broad, rounded or broadly grooved. Prothorax with small lobe; thorax robust; legs long and very robust; hind femora with rows of closely-set, numerous, small, imbricated spines; *claw-hooks very robust, as broad and often as long as the claws themselves*. Abdomen long and narrow, although decidedly shorter than the wings, slightly dilated dorso-ventrally at base, slightly constricted at segments 3 and 4, then slim and parallel-sided to the end. Wings long and narrow, node lying far distal in fore-wing, reticulation rather open; discoidal cell in fore-wing with

costal side half or less than half the length of basal or distal side, entire or traversed; that of hind-wing entire or traversed, its base situated slightly proximal to level of arc; sectors of arc shortly fused in fore-wing, with a longer fusion in the hind; arc situated between the first and second antenodal nervure or opposite the second; $10\frac{1}{2}$ to $18\frac{1}{2}$ antenodal nervures, the distal one incomplete; 1 or 2 cubital nervures in fore-wing, only 1 in the hind; *Cuii* arising variably from the posterior angle of discoidal cell in hind-wing or from the distal side; discoidal field beginning with rows of 2, 3 or 4 cells, usually only 3; 1 or 2 rows of cells between *IRiii* and *Rspl*, its sides parallel or converging at wing-border; no supplementary nervures to bridge; *Riii* and *IRiii* often markedly undulated; subtrigone in fore-wing 1- to 5-celled, usually 3-celled; anal loop very long, dilated at distal end, and markedly angulated.

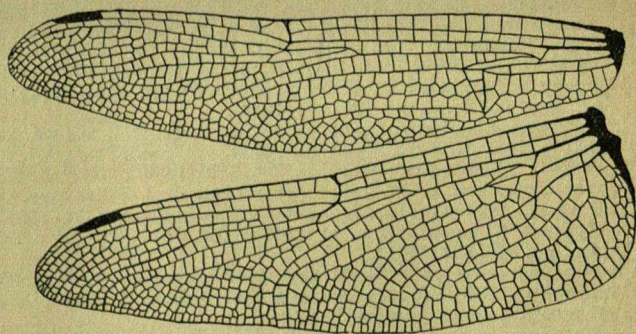


Fig. 110.—Wings of *Zygonyx iris malabarica* Fraser, male.

at distal side; pterostigma small; membrane moderately large. Genitalia variable in the species.

Distribution.—Ethiopian and Oriental. This large genus has its species about evenly divided between Africa and S. Asia and the Sundaic Archipelago. It is characterized by the remarkable Corduline facies of its species, a circumstance which led the old authors to place them in the Corduliinæ. The rounded base of the hind-wing in both sexes, the shape of the eyes, and the absence of keels on the male tibiæ show them to be true Libellulines however. It is interesting to note that their habits and habitats are also Corduline in character, and it may be that their reaction to the latter has brought about this similarity by convergence. All breed in swift montane streams, and their larvæ are adapted, by a flat limpet-like abdomen, to cling to rocks, whilst the body is generally stream-lined. The imagos hawk over a limited beat over rivers, generally



over a rapid or below a waterfall, whilst, after first emergence, they soar above the forest at great heights and may be observed with field-glasses in vast numbers at heights of several hundred feet. They pair over water and the sexes travel *in copula* for great distances up-stream seeking suitable situations to deposit the eggs. A number of subspecies of two species are found within our limits. All these are purely Oriental except *Z. torrida isis*; in regard to the others, probably some at least are mere varieties or geographical races.

Genotype, *Zygonyx iris* Selys.

Key to Indian Subspecies of Zygonyx.

1. { Thorax with complete humeral stripe 2.
Thorax with only a small round yellow spot
at lower part of humeral region 7. [p. 397.]
2. { Base of hind-wing broadly amber-yellow. *iris davina* Fraser,
Base of hind-wing uncoloured 3.
3. { Abdominal segments 2 to 8 with large
yellow spots each side, those on seg- [p. 401.]
ments 6 and 7 confluent with mid-
dorsal spots *torrida isis* Fraser,
Abdominal segments 2 to 8 unmarked or
with mid-dorsal carina finely yellow or
segment 7 with a large mid-dorsal
prominent yellow spot 4.
4. { Only a single row of cells between *IRiii*
and *Rspl*; segment 7 with a large sagit- [p. 394.]
tate mid-dorsal yellow spot; occiput
yellow at centre *iris iris* Selys,
Two rows of cells between *IRiii* and *Rspl*. 5.
5. { Abdominal segments 3 to 10 unmarked;
discoidal field in fore-wing beginning
with only 2 rows of cells *iris isa* Fraser, p. 400.
Abdominal segments 3 to 7 with mid-
dorsal carina finely yellow; discoidal
field in fore-wing beginning with 3 rows
of cells 6.
6. { Subtrigone in fore-wing 3-celled; distal
antenodal nervure in fore-wing incom- [p. 399.]
plete; face largely yellow *iris mildredæ* Fraser,
Subtrigone in fore-wing 5-celled; distal
antenodal nervure in fore-wing com- [p. 400.]
plete; face largely black *iris osiris*, sp. nov.,
7. { Segment 7 without any yellow marking; [p. 396.]
face and sides of thorax largely black. *iris ceylanica* (Kirby),
Segment 7 with a large prominent yellow
spot on mid-dorsum; face and sides of
thorax more broadly yellow 8.
8. { Mid-dorsal spot on segment 7 scutellate, [p. 395.]
broadening apically *iris malabarica* Fraser,
Mid-dorsal spot on segment 7 fusiform, [p. 398.]
tapering basally and apically *iris metallica* Fraser,

508. *Zygonyx iris iris* Selys. (Fig. 111, b.)

Zygonyx iris Selys, Ann. Soc. Ent. Belg. vol. xii, p. 97 (1869); id., Ann. Mag. Nat. Hist. (4) vol. iii, p. 274 (1869); Kirby, Cat. Odon. p. 184 (1890); Selys, C. R. Soc. Ent. Belg. p. 6 (sep.) (1891); Martin, Mission Pavie, Zool. p. 8 (sep.) (1904); Fraser (pars), J. Bombay Nat. Hist. Soc. vol. xxvi, pp. 763, 764 (1919).

Zygonyx iris iris Fraser, J. Bombay Nat. Hist. Soc. vol. xxxi, pp. 763, 764 (1926).

Male.—Abdomen 39 mm. Hind-wing 45 mm.

Head: labium bright citron-yellow, middle lobe and borders of lateral lobes broadly black; labrum black; anteclypeus, postclypeus, and lower border of frons dull yellow, lower border of postclypeus dark brown at middle; frons yellow laterally, above and including crest dark metallic blue; vesicle dark

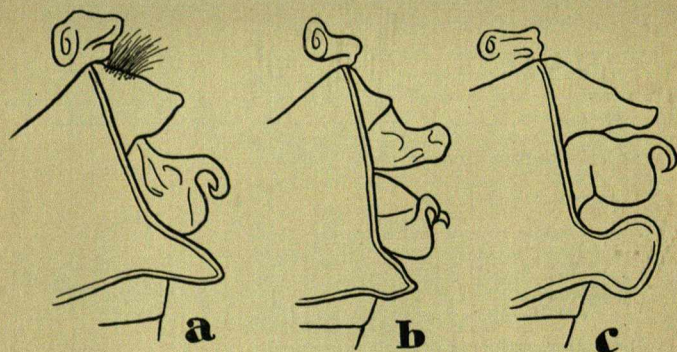


Fig. 111.—Male genitalia of (a) *Onychothemis testacea ceylanica* Ris; (b) *Zygonyx iris iris* Selys; (c) *Zygonyx torrida isis* Fraser.

metallic blue; occiput dark brown centred with bright yellow; eyes dark reddish-brown above, paler laterally and below. *Prothorax* blackish-brown, anterior border of anterior lobe finely, middle of dorsum of mid-lobe and whole of posterior lobe dull yellow. *Thorax* dark metallic blue or greenish-blue, with the mid-dorsal carina finely, a broad humeral stripe, the posterior half of mesepimeron and posterior two-thirds of metepimeron bright citron-yellow; beneath yellow. *Legs* black, anterior femora bright yellow on inner side, claw-hooks longer than claws. *Wings* very palely enfumed, but extreme apices darker brown; pterostigma black, covering about 3 cells, occasionally braced; membrane dark brown; nodal index $\frac{9-15\frac{1}{2}}{11-12} | \frac{14\frac{1}{2}-9}{12-11}$; distal antenodal occasionally complete; 3 rows of cells at beginning of discoidal field in fore-

wing; 1 or 2 cubital nervures in fore-wing, 1 in the hind; only 1 row of cells between *IRiii* and *Rspl*; all discoidal cells traversed once; anal loop acutely angled at its distal side; subtrigone in fore-wing 3-celled. *Abdomen* black, with sides of segments 1 to 3 broadly yellow, segment 2 with a subdorsal quadrate basal spot; mid-dorsal carina broadly yellow on segments 1 to 3, very narrowly on segments 4 to 6, a broad sagittate-shaped spot on mid-dorsum of segment 7 with its broad end near base of segment; an occasional geminate mid-dorsal subbasal spot on segment 8, remaining segments unmarked. *Anal appendages* black; apices of superiors produced and with a ventral spine below. For *genitalia* see fig. 111, b.

Female unknown.

Distribution.—BENGAL and ASSAM. Apparently a very local insect.

The *type*, a male, in the Selys collection, Brussels Museum, is from Panibas, Bengal (I have been unable to locate the name); I have a male and Mr. Morton has males also, all from Shillong, Assam.

509. *Zygonyx iris malabarica* Fraser. (Fig. 110.)

Zygonyx iris Fraser (pars), J. Bombay Nat. Hist. Soc. vol. xxvi, pp. 741, 742 (1919); id., Rec. Ind. Mus. vol. xxvi, pp. 426, 442 (1924).

Zygonyx iris malabarica Fraser, J. Bombay Nat. Hist. Soc. vol. xxxi, pp. 763-766 (1926); id., Rec. Ind. Mus. vol. xxxiii, pp. 446, 451 (1931).

Male.—Abdomen 40-42 mm. Hind-wing 46-48 mm.

Closely similar to *Z. iris iris*; differs as follows:—Borders of lateral lobes of labium narrowly black; sides of frons and postclypeus bright citron-yellow; occiput black. Yellow markings on thorax much reduced, only a small lower rounded spot on humeral region and an antero-lateral yellow stripe broadly interrupted at its middle. *Wings* often slightly enfumed at extreme apices and with a small dark brown spot at extreme base of hind-wing; membrane cinereous, with narrow white border; pterostigma covering only 1 to $1\frac{1}{2}$ cells;

nodal index $\frac{8-15\frac{1}{2}}{9-10}$ $\frac{15\frac{1}{2}-8}{11-9}$ $\frac{8-14\frac{1}{2}}{10-10}$ $\frac{13\frac{1}{2}-10}{10-10}$; 1 to 3 cubital

nervures in fore-wing; anal loop less acutely angled at distal side; other venational details similar to *iris iris*. *Abdomen* with sides of segments 1 to 3 broadly yellow, tapering to a point apically on latter segment; fine yellow annules at level of jugum on segments 2 and 3; narrow basal annules on segments 4 to 7, interrupted on each side of mid-dorsal carina on 6 and 7; the latter segment with a broad scutellate-shaped yellow spot on basal half of mid-dorsum, this as broad



or broader at its apical end as base. Segment 8 sometimes with a small subdorsal basal yellow point. *Genitalia* markedly different, lamina produced at anterior border and projecting perpendicularly to plane of abdomen; hamules projecting as a short column. Apices of superior *anal appendages* more tapered.

Female.—Abdomen 40–43 mm. Hind-wing 47–49 mm.

Closely similar to male in colour and markings, but differing in shape of abdomen, which is cylindrical, more robust, more tumid at base, and not constricted at segments 3 and 4; *thorax* with broad complete humeral, medio-lateral, and postero-lateral yellow stripes; tergum spotted with citron-yellow; *wings* with apices more darkly enfumed and with the basal brown spot in hind-wing larger and better defined; venational details similar to the male, variable within narrow limits. *Abdomen* with mid-dorsal carina, from segment 1 to middle of segment 6, very finely yellow; other yellow markings similar to male. *Anal appendages* slender, curved outwardly, acuminate at apex, black; vulvar scales very short, very broad, consisting of two narrowly triangular lobes.

Distribution.—Restricted to S. INDIA, and common in the Nilgiris, Palnis, Coorg, and Annaimallai Hills. Less common in the Shevaroy Hills and hills about Chingleput, Madras. Occurs also in many parts of the Western Ghats below Bombay, S. Kanara, and Malabar. The restricted yellow markings on thorax of male, the shape of the male genitalia, and the shape of the dorsal yellow spot on segment 7 will serve to identify this subspecies.

Type and allotype female in the British Museum; many specimens of both sexes in the Author's collection.

510. *Zygonyx iris ceylanica* (Kirby).

Zygonia ceylanica Kirby, Ann. Mag. Nat. Hist. (7) vol. xv, p. 273 (1905).

Zygonyx iris Ris, Cat. Coll. Selys, fasc. xiv, pp. 820, 822 (1912); Laidlaw, Spolia Zeylanica, vol. xii, p. 349 (1924).

Male.—Abdomen 37–40 mm. Hind-wing 50–52 mm.

Very similar to the last subspecies and differing from *Z. iris* in the same particulars. Differs from *Z. iris malabarica* as follows:—*Wings* of great length, much longer relatively to abdomen than in other Indian species; no basal marking to hind-wing; membrane black; nodal index $\frac{9-15}{11-11} | \frac{15\frac{1}{2}-9}{11-10}$, $\frac{10-16\frac{1}{2}}{11-11} | \frac{17\frac{1}{2}-12}{11-11}$; other details similar to *iris iris*. *Abdomen* black, with yellow markings greatly restricted; sides of segments 1 to 3 narrowly and mid-dorsal carina very finely



yellow from segment 2 to 6 or 7, no dorsal spot on latter. *Anal appendages and genitalia* similar to *Z. iris malabarica*.

Female.—Abdomen 45 mm. Hind-wing 50 mm.

Resembles the female of *Z. iris malabarica*, but the yellow markings more restricted on thorax and abdomen, as in the male.

Distribution.—CEYLON only. I have a number of males from Nalande and Haragama, taken in May, June, and September. I found it common on all streams around Kandy. This subspecies is easily distinguished from *Z. iris iris* by the entire absence of the yellow mid-dorsal spot on segment 7 and also by its great wing-expanse, which is even greater than in *Z. iris malabarica*.

The *type* in the British Museum; specimens of both sexes in the Colombo Museum, Ceylon.

511. *Zygonyx iris davina* Fraser.

Zygonyx iris davina Fraser, J. Bombay Nat. Hist. Soc. vol. xxxi, pp. 768, 769 (1926).

Male.—Abdomen 38 mm. Hind-wing 43 mm.

Head: labium yellow, middle lobe and apposed borders of lateral lobes broadly black; labrum black; anteclypeus brownish-yellow; postclypeus citron-yellow, this colour extending up on each side of frons and obscured medially by a cloud of metallic blue with faint reflex; frons and vesicle dark metallic blue; occiput brown. *Prothorax* black, with a median geminate spot on middle lobe, a narrow anterior collar and the whole of posterior lobe citron-yellow. *Thorax* dark metallic bluish-green marked with citron-yellow, as follows:—The mid-dorsal carina finely, a slightly sinuous, moderately broad humeral stripe, a very broad medial lateral oblique stripe on each side and, finally, rather more than the posterior half of metepimeron. *Legs* black, anterior femora bright yellow within; claw-hooks equal. *Wings* hyaline, tipped narrowly with brown; extreme bases of hind-wings tinted with golden-amber in subcostal, cubital, and anal spaces; pterostigma black, equal in fore- and hind-wings, covering 2 to 5 cells; nodal index $\frac{9-13\frac{1}{2}}{9-10} \mid \frac{13\frac{1}{2}-9}{10-9}$; discoidal triangles traversed once; 2 cubital nervures in fore-wings, 1 in the hind; anal loop very long, its apex slightly recurved; discoidal field beginning with four rows of 3 cells, followed by two rows of 2 cells; only 1 row of cells between *IRiii* and *Rspl*; sub-trigone in fore-wing 3 -celled; membrane blackish-brown. *Abdomen* black, marked with citron-yellow as follows:—Segment 1 with a basal annule, a triangular apical dorsal spot, and a broad lateral apical quadrate spot; segment 2 almost

entirely yellow, marked with an irregular subdorsal stripe arrested basally at the jugal suture and by a small lateral isolated spot; segment 3 similar to 2, but the subbasal stripe of black extending from base to apex and forming a narrow black apical annule; segments 4 to 6 with a narrow mid-dorsal stripe; segment 7 with a broader sagittate mid-dorsal stripe; remaining segments unmarked. *Anal appendages* and *genitalia* very similar to those of *Z. iris iris*.

Female.—Abdomen 44 mm. Hind-wing 47–50 mm.

Closely similar to the male, but a larger and more robust insect; differs as follows:—Medial portion of postclypeus brown with metallic blue reflex, or a glossy black; occiput black or centred with yellow; humeral stripes broader and, in some specimens, the upper portion prolonged inwards or outwards, but this marking very variable and the stripe often narrower than in the male. *Wings* hyaline, tipped variably with dark brown, but this marking sometimes absent; bases of all wings broadly coloured with dark golden-amber to a somewhat variable extent, usually to as far out as the arc in the fore-wing and thence to the posterior border, and to a little distal of the discoidal triangle in hind-wing, extending in a curve from that point to the tornus or base of wing; in some more adult examples the whole wing is tinted a yellowish-brown, this forming an areola or network corresponding to the venation of the wings and being superimposed on the basal golden-yellow marking; nodal index higher, $\frac{11-15\frac{1}{2}}{15-12} \mid \frac{17\frac{1}{2}-9}{10-11}$, but very variable. Other details of venation and markings of *abdomen* similar to male. *Anal appendages* black, shortly conical.

Distribution.—KHASIA HILLS and Pashok, DARJEELING DISTRICT. The subspecies appears to be more common in the Khasias and is probably from Shillong. It is easily distinguished from all other species and subspecies by the broad yellow markings of body and by the basal yellow area at base of wings in the female.

The *type* is a female in the Darjeeling Museum, taken in May in the Darjeeling district; allotype male in Dr. St. Quentin's collection, Vienna.

512. *Zygonyx iris metallica* Fraser.

Male.—Abdomen 40 mm. Hind-wing 44 mm.

Very similar to *Z. iris malabarica*, of which it may be but a variety. Differs by a greater melanism, higher nodal index, and closer reticulation of wings and a somewhat differently shaped anal loop. Humeral stripe reduced to small lower spot; mid-lateral stripe broken up into two or three spots, whilst the posterior stripe on metepimeron covers less than half

of that structure. Yellow on side of segments 2 and 3 also reduced, but a small baso-lateral spot on segments 4 to 7; mid-dorsal spot on segment 7 smaller and oval or fusiform in shape, tapering at both ends. *Wings* with apices usually more or less narrowly enfumed with brown and often tinted throughout; nodal index $\frac{11-16}{12-12} \mid \frac{15\frac{1}{2}-10}{13-12}$, anal loop very acutely angulated at distal side. *Anal appendages* and *genitalia* similar to *Z. iris malabarica*.

Female.—Abdomen 41 mm. Hind-wing 50 mm.

Resembles the male in all respects save sexual characters, which latter are similar to those of *Z. iris malabarica*.

Distribution.—Confined to the western side of the WESTERN GHATS and very local but common where found. It is perhaps only a variety of *Z. iris malabarica*, characterized by its smaller size, more restricted yellow markings, oval shape of spot on mid-dorsum of segment 7, closer reticulation, etc.

Type in the Author's collection.

513. *Zygonyx iris mildredæ* Fraser.

Zygonyx iris mildredæ Fraser, J. Bombay Nat. Hist. Soc. vol. xxxi, pp. 766, 767 (1926).

Male.—Abdomen 36 mm. Hind-wing 41 mm.

Closely allied to *Z. iris iris*, which it resembles in most respects; differs as follows:—Labium with lateral lobes narrowly bordered with black; face with the dark markings restricted to a brown clouding at lower part of postclypeus; humeral stripe much narrower and clouded with brown above. *Wings* with 2 rows of cells between *IRiii* and *Rspl*; nodal index $\frac{9-16\frac{1}{2}}{11-10} \mid \frac{16\frac{1}{2}-9}{10-11}$. *Abdomen* black, with mid-dorsal carina finely yellow on segments 1, 2, and 5 to 7, the latter without a mid-dorsal yellow spot. Segments 1 and 2 with a yellow stripe tapering apically on the latter segment. *Anal appendages* and *genitalia* closely similar to that of *Z. iris malabarica*.

Female.—Abdomen 40 mm. Hind-wing 46 mm.

Resembles the male closely, but the yellow markings slightly more extensive; face entirely bright citron-yellow as far as metallic area on upper surface of frons; humeral stripe on thorax brighter and better defined; abdomen with mid-dorsal carina on segments 1 and 2 rather broadly yellow and very finely so thereafter to as far as segment 7; segments 1 to 3 rather broadly yellow, tapering away on latter segment. Venation of wings similar to male. *Anal appendages* and vulvar scale similar to that of *Z. iris malabarica*.

Distribution.—Maymyo, UPPER BURMA. I have five males and a single female of this very black melanotic subspecies, which is characterized by the absence of the mid-dorsal spot



on segment 7 in both sexes and the presence of 2 rows of cells between *IRiii* and *Rspl*. In these respects it resembles the next subspecies, but *Z. iris isa* has only 2 rows of cells at beginning of discoidal field in fore-wing instead of 3 rows as in *mildredæ*.

Type and allotype female in the Author's collection.

514. *Zygonyx iris isa* Fraser.

Zygonyx iris isa Fraser, J. Bombay Nat. Hist. Soc. vol. xxxi, pp. 767, 777 (1926).

Male.—Abdomen 37 mm. Hind-wing 44 mm.

Closely resembles the last species, from which it differs by the yellow markings largely clouded with brown, especially on the thorax. *Wings* hyaline, membrane dark brown; 2 rows of cells between *IRiii* and *Rspl*; discoidal field in fore-wing beginning with 2 rows of cells only; nodal index $\frac{9-14\frac{1}{2}}{9-10} \mid \frac{14\frac{1}{2}-8}{9-9}$ (much lower than usual). *Abdomen* black, with dark green metallic reflex and very restricted yellow markings, as follows:—Sides of segments 1 and 2 narrowly and base and mid-dorsal carina of segment 2 finely, the rest unmarked. *Anal appendages* and *genitalia* not differing from *Z. iris malabarica*.

Female unknown.

Distribution.—Maymyo, UPPER BURMA. The very black, unmarked abdomen, together with the character of the discoidal field of fore-wing, beginning with only 2 rows of cells, will serve to distinguish this subspecies from all others.

Type in the Author's collection.

515. *Zygonyx iris osiris*, sp. nov.

Male.—Abdomen 43 mm. Hind-wing 49 mm.

Resembles *Z. iris mildredæ* rather closely, differs by humeral stripe broader and better defined; mid-dorsal carina of segments 2 to 8 very finely yellow as well as bases of 3 and 4; sides of segments 1 and 2 with an irregular yellow stripe. *Wings* with much closer reticulation: subtrigone in fore-wing 5-celled; discoidal cells in hind-wing traversed twice; 2 or 3 cubital nervures in fore-wings; nodal index $\frac{10-18}{11-11} \mid \frac{17-9}{12-10}$; 2 rows of cells between *IRiii* and *Rspl*; some double cells between *Riv+v* and *Mspl* in fore-wing; hypertrigones in fore-wing occasionally traversed. *Anal appendages* and *genitalia* similar to last species.

Female unknown.

Distribution.—Ani Sakan, North Shan States, BURMA. Distinguished from other subspecies by its close venation and by the abdomen with very restricted markings. It is the only species with subtrigone of fore-wing with more than three cells and the distal antenodal nervure complete.

Type in the Author's collection.

516. *Zygonyx torrida isis* Fraser. (Fig. 111, c.)

Zygonyx isis Fraser, Rec. Ind. Mus. vol. xxvi, pp. 426, 440, 441 (1924).

Zygonyx torrida isis Fraser, Rec. Ind. Mus. vol. xxxiii, p. 446 (1931).

Male.—Abdomen 37–39 mm. Hind-wing 44–46 mm.

Head: labium dark blackish-brown, outer borders of lateral lobes bright ochreous or pale brown; labrum blackish-brown; anteclypeus pale to dark brown; postclypeus dark olivaceous to almost black; lower border of frons narrowly and lower part of sides of frons more broadly bright yellow; frons above and vesicle dark metallic violet; occiput dark olivaceous-brown; eyes brown above, dark lilaceous below. *Prothorax* dark reddish-brown, anterior collar yellow, with a broad black belt between it and middle lobe. *Thorax* dark metallic green, marked obscurely with yellow as follows:—A humeral stripe bright yellow below, but becoming reddish-brown above, usually only visible as a small inferior spot, a narrow stripe on mesepimeron more or less obscured in its upper part with brown, a broken stripe just posterior to this consisting of three spots and, lastly, a well-defined brown stripe on metepimeron. *Legs* black, anterior femora yellow at base, claw-hooks robust but only half the length of claws. *Wings* hyaline, but tinted with yellow throughout except at base, apices often enfumed with brown; membrane white; pterostigma black, longer in fore-wing than in hind; nodal index $8-11\frac{1}{2} \mid 19\frac{1}{2}-8 \quad 8-10\frac{1}{2} \mid 10\frac{1}{2}-8$; only 1 cubital nervure in fore-wing; discoidal cell in hind-wing entire; anal loop very long and attenuate; 3 rows of cells in discoidal field of fore-wing.

Abdomen black, marked with bright yellow as follows:—Segment 1 with a small spot on each side; segment 2 with a broad lateral transverse stripe apical to jugal suture interrupted below; segment 3 with a very narrow basal ring usually broadly interrupted on dorsum, but expanding below, and a very large apico-lateral spot with its base resting on jugal suture; segments 4 to 8 with large medio-lateral spots and smaller mid-dorsal, the latter expanding apically and becoming confluent with former on segments 6 and 7; segments 9 and 10 unmarked or 9 with an obscure lateral spot. *Anal appendages* black, similar to those of *Z. iris iris*, but the

apex more produced and the spines beneath more robust. *Genitalia* differing more strongly from other species (see fig. 111, e).

Female.—Abdomen 42 mm. Hind-wing 48–50 mm.

Closely similar to the male, but a larger and more robust insect; differs as follows:—Labium occasionally entirely black; sides of postclypeus, sides and lower part of frons in front, including crest, bright chrome- or golden-yellow; vesicle yellow at apex. Humeral stripe complete and well defined, sinuous at sides, strongly angulated inwards above and crossing upper border of dorsum to become confluent with its fellow on the other side; an obscure yellow stripe in front of its lower part becoming reddish on dorsum of thorax; lateral stripes similar but much more sharply defined. *Wings* more deeply tinted with yellow and, in some specimens, becoming burnt-brown towards apices; venational details similar to male, but discoidal cell in fore-wing often entire, as well as that of hind-wing; pterostigma longer. *Abdomen* with yellow markings larger and the spots confluent on segments 5 to 7 or 8. *Anal appendages* narrow, acuminate, rather long, black; vulvar scale very small, deeply emarginate; ninth ventral plate swollen, apical border broadly rounded and overlapping segment 10.

Distribution.—This subspecies is very closely related to *Z. torrida torrida* (*Pseudomacromia torrida* Kirby), which has been reported from most parts of Africa, Canaries, Spain, and Palestine, and is probably not more than a geographical race, distinguished by its greater melanism. The imago is on the wing from September to November and is found hawking over rapids of submontane streams at the foothills. The large paired spots on segments 2 to 8 and the coloured wings are sufficient to identify this subspecies from others of the genus belonging to our fauna.

Type in the British Museum, allotype female in the Author's collection, where are also males from Fraserpet, Coorg; Anatagiri Ghat, Agency Tracts, and Salt Range, Punjab, and females from Nandapur, Agency Tracts, E. India.

Genus **ONYCHOTHEMIS** Brauer. (Fig. 112.)

Onychothemis Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, pp. 170, 365, 732 (1868); Kirby, Trans. Zool. Soc. Lond. vol. xii, pp. 258, 284 (1889); id., Cat. Odon. p. 24 (1890); Karsch, Berlin Ent. Zeit. vol. xxxiii, p. 357 (1890); Kirby, Ann. Mag. Nat. Hist. (7) vol. xv, p. 277 (1905); Ris, Cat. Coll. Selys, fascs. ix, xiv, pp. 33, 831, 833 (1909, 1912); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, pp. 742, 743 (1919).

Libelluline dragonflies of rather large size and very robust build, characterized by their dark metallic colouring with

bright yellow markings and by the claws, which are unique in being devoid of the usual hooks. (In this respect they contrast strikingly with species of the last genus, in which the hooks of the claws are as long or longer than the claws.) Head comparatively small; eyes contiguous for but a short distance; frons narrow, rather prominent, rounded and without definite crest; vesicle high, broadly rounded. Prothorax with moderately large posterior lobe, minutely emarginate and fringed with long hairs. Thorax very robust; legs very long and robust; hind femora with 5 to 8 very robust, widely spaced, gradually (or often irregularly) lengthening spines, the penultimate one very long; claws without visible hooks (a microscopic vestige may sometimes be seen). Wings long and moderately broad, with close reticulation; discoidal cell in fore-wing with short costal side, less than half the length

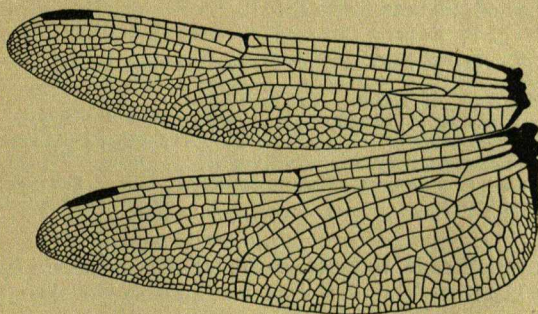


Fig. 112.—Wings of *Onychothemis testacea ceylanica* Ris, male.

of basal, traversed; that of hind-wing entire, its base at level of arc; sectors of arc widely fused; arc situated between the first and second antenodal nervures; $14\frac{1}{2}$ to $17\frac{1}{2}$ antenodal nervures, the final or distal incomplete; 1 cubital nervure to all wings; *Cu* in the hind-wing arising from posterior angle of discoidal cell; discoidal field beginning with 3 rows of cells, its borders slightly divergent at wing-border; no supplementary nervures to bridge; subtrigone in fore-wing 3- or 4-celled; 2 rows of cells between *IR* and *Rs*; anal loop very long, strongly angulated and tapered distally; pterostigma rather small, narrow; membrane large; *R* and *IR* markedly undulated. Abdomen robust, broad dorso-ventrally at base and somewhat widened, then tapering gradually to anal end and with a high mid-dorsal keel or carina. Genitalia: lamina hood-shaped;



hamules with broad compact base and short, robust, strongly-curved hook; lobe short, tapered, and with a short accessory lobe at end. No distinct vulvar scales; borders of segment 8 not dilated.

Genotype, *Onychothemis abnormis* Brauer.

Distribution.—INDIA, CEYLON, and BURMA, Malaysia, Indo-China, Java, Sumatra, Borneo, and the Philippines. Two species only are found within our limits, one from Burma only, but the other widely distributed in submontane areas throughout Ceylon and India. Species of this genus are bold and strong fliers, although their flight is usually short; they are found in dense jungle along the borders of submontane streams flashing up and down on a short beat, taking frequent rests and attacking all other large dragonflies which may pass within their vicinity. The females oviposit in shallows flowing under the shade of dense jungle, threading their way into the interstices of thickets to do so.

Key to Indian Species of Onychothemis.

Ground-colour of thorax dark metallic green; abdomen black, marked with bright yellow spots.....	[Ris, p. 404. <i>testacea ceylanica</i>
Ground-colour coppery-brown with metallic reflex; abdomen almost entirely reddish-brown	[Förster, p. 406. <i>culminicola culminicola</i>

517. *Onychothemis testacea ceylanica* Ris. (Figs. 111, a, & 112.)

Onychothemis tonkinensis ceylanica Ris, Cat. Coll. Selys, fasc. xiv, pp. 832, 835 (1912); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, pp. 743, 744 (1919).

Onychothemis testacea ceylanica Laidlaw, Spolia Zeylanica, vol. xii, p. 349 (1924); Fraser, Rec. Ind. Mus. vol. xxvi, pp. 426, 442 (1924); id., ibid. vol. xxxiii, p. 446 (1931).

Male.—Abdomen 34–36 mm. Hind-wing 40–42 mm.

Head: labium bright ochreous, middle lobe and adjacent parts of lateral lobes black; labrum black, with a more or less well-defined yellow spot on each side of base; anteclypeus and postclypeus bright yellow, with a broad curved black stripe on latter resembling a bushy moustache across the face; frons and vesicle dark metallic blue, with lower border of former in front narrowly bright yellow; eyes bottle-green during life; occiput black, with a large yellow spot posteriorly. *Prothorax* black, borders of anterior and posterior lobes and two dorsal spots on middle lobe bright yellow; *thorax* dark metallic blue, marked with citron-yellow as follows:—Mid-dorsal carina very finely, a humeral stripe which may be reduced



to a small lower spot or an upper and lower spot, or be complete, sinuous, or irregular; a narrow complete stripe on mesepimeron at level of spiracle and the posterior third of metepimeron. *Legs* black. *Wings* hyaline, apices variably tipped with diffuse brown or clear; pterostigma black, long, and narrow;

membrane black; nodal index $\frac{9-14\frac{1}{2}}{10-10} \mid \frac{14\frac{1}{2}-8}{10-10} \mid \frac{10-16\frac{1}{2}}{11-11} \mid \frac{15\frac{1}{2}-11}{11-11}$

base of discoidal cell in hind-wing often slightly proximal to level of arc; other details of venation similar to genus. *Abdomen* black, marked with citron-yellow and reddish-ochreous as follows:—Segment 1 with a triangular spot on mid-dorsum; segment 2 with a small diamond-shaped spot on mid-dorsum, with its centre on jugal suture and a narrow stripe on this suture each side; segment 3 with its base dorsally and subdorsally narrowly yellow, a stellate spot on mid-dorsum with its centre on jugal suture and bifid apically, and lastly, a large ventro-lateral spot on the jugal suture; segments 4 to 9 similar to 3, but the lateral spots on 4 to 6 much smaller and confluent with the mid-dorsal spot, which on segments 5 to 9 is very much larger, enlarging from segment to segment until segment 9 is almost entirely yellow; the lateral and posterior borders of this latter spot changing to rust-red; segment 10 entirely yellow save for the lower lateral and apical borders; segments 3 to 8 with large paired spots of citron-yellow beneath. (Specimens from Western India and N. Bengal have the abdominal markings restricted and are without the red colouring on end segments; the mid-dorsal and lateral spots on segments 4 to 6 not confluent, those on 7 barely so, whilst those on 8 and 9 are very small and confined to base and dorsum of segments; segment 10 black or with but a basal trace of yellow.) *Anal appendages* black, slim, and cylindrical for basal two-fifths, then dilated abruptly and tapered gradually to the end, which is acuminate and with a robust spine beneath at site of dilatation, the posterior border of which is finely spined. *Genitalia* as for genus; the projection from the apex of lobe strongly marked in Ceylon forms, but poorly so or quite absent in Indian forms.

Female.—Abdomen 36 mm. Hind-wing 42–44 mm.

Resembles the male in all respects save sexual characters and abdominal markings; vesicle in southern forms capped with a large yellow spot; abdomen much stouter at base, with yellow markings much restricted on most segments: Bengal forms are very similar to the male, but the ventro-lateral and mid-dorsal spots are barely confluent, and that on segment 8 is well defined and limited to dorsum on basal half of segment; segments 9 and 10 are unmarked; Ceylon and South Indian forms from the Western Ghats have the spots confluent on



segment 3 to form a complete annule at level of jugum and broadening on dorsum and sides ; the lateral spots are absent on segment 6 to the end or present as a mere point on 6, whilst the dorsal spots on segments 4 to 8 are sharply defined but small and broadly separated from the lateral ; segment 9 immaculate or with a very small baso-dorsal point ; segment 10 unmarked. *Wings* in very old females often rather deeply and evenly enfumed with brown. *Anal appendages* black, short, tapered. *Genitalia* as for genus.

Distribution.—I have specimens from Kandy and Nalande, CEYLON, taken in October ; from Fraserpet and Bhagmandala, COORG, taken in June ; from the Mudis Hills, S. INDIA, taken in May ; from Kalar, NILGIRI HILLS, taken in June ; and lastly, from the Silli Tootsa River, Hasimara, Duars, BENGAL, also taken in June. Very little variation, apart from the markings of the abdomen, is found ; Ceylon forms can be detected from continental forms by the character of the lobe, which appears notched in the former. The imago is to be sought for in the bed of streams at the foothills and, on account of its shy, retiring habits, one has to wade far up the bed of the stream into the depths of jungle before finding it. The metallic colouring of the thorax and characteristic markings of abdomen will serve to identify this species.

The *type* is from Nalande, Ceylon, and, with two other males from the same locality, is in the Selys collection, Brussels Museum.

518. *Onychothemis culminicola culminicola* Förster.

Onychothemis culminicola Förster, Insektenborse, vol. xxi, p. 356 (1904).

Onychothemis abnormis Ris, Ann. Soc. Ent. Belg. vol. lxxv, p. 254 (1911).

Onychothemis culminicola culminicola Ris, Cat. Coll. Selys, fasc. xiv, pp. 833, 835, 836 (1912) ; Fraser, J. Bombay Nat. Hist. Soc. vol. xxx, p. 48 (1924) ; Laidlaw, J. F.M.S. Mus. vol. xvi, pp. 228, 240 (1930) ; Lieftinck, Treubia, vol. xiv, p. 420 (1934).

Male.—Abdomen 28–33 mm. Hind-wing 37–40 mm.

Head : labium and labrum bright ochreous ; face and frons olivaceous, the latter reddish-brown above ; vesicle and occiput ochreous ; eyes brown. *Prothorax* and *thorax* coppery-brown, darker on sides of latter, which have a metallic blue reflex ; marked with yellow similar to *O. testacea ceylanica*. *Legs* dark reddish-brown at base, deepening to black at distal end of femora and tibiæ. *Wings* hyaline, palely diffused with brown ; pterostigma short, narrow, black ; membrane blackish-brown ;

nodal index $\frac{10-12\frac{1}{2}}{11-10} \mid \frac{12\frac{1}{2}-10}{10-10}$; other details of venation similar



to genus. *Abdomen* bright rust-red, with narrow yellow annules at base of segments 2 to 6 and very fine lines at jugal sutures on segments 2 and 3; apical ends of segments 2 to 8 narrowly black. *Anal appendages* red at base, deepening to blackish-brown at apices; shaped similarly to those of *O. testacea ceylanica*; inferior appendage bifid at apex. *Genitalia* very similar to the latter subspecies, but the hamules more robust and the lobe narrow, produced, and without an apical notch or process.

Female.—Abdomen 31–33 mm. Hind-wing 41–46 mm.

A larger and more robust insect than the male, but coloured and marked exactly the same. *Abdomen* much stouter at base and with the basal black on segments 2 to 8 more extensive; pterostigma longer, ochreous; nodal index $\frac{10-14\frac{1}{2}}{11-9} \mid \frac{14\frac{1}{2}-9}{9-11}$.

Genitalia as for genus.

Distribution.—BURMA, Malaysia, Java, Sumatra, Borneo. I have a pair from Moulmein, Lower Burma, these being the only two specimens so far taken within Indian limits. The habits of this species are similar to those of the last and it is found in similar situations. Its bright coppery colouring with restricted yellow markings on abdomen will serve to determine it from *testacea ceylanica*.

Type in the Förster collection, Ann Arbor, Michigan University.

Genus **ZYXOMMA** Rambur. (Fig. 113.)

Zyxomma Rambur, Ins. Névropt. pp. 26, 30 (1842); Hagen, Stett. Ent. Zeit. vol. x, p. 171 (1849); Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, pp. 364, 712 (1868); Kirby, Trans. Zool. Soc. Lond. vol. xii, pp. 258, 301 (1889); id., Cat. Odon. p. 35 (1890); Förster, Jber. Mannheim, vols. lxxi, lxxii, p. 3 (sep.) (1906); Ris, Cat. Coll. Selys, fascs. ix, xv, pp. 35, 900–902 (1909, 1913); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvii, pp. 255, 256 (1920).

Dragonflies of moderate size and slender build, characterized by the shape of the abdomen, open apex of anal loop in hind-wing, and by their crepuscular habits. Head large, globular; eyes very broadly contiguous; frons rounded, without defined crest; vesicle hood-shaped, shutting in middle ocellus. Prothorax with small posterior lobe; thorax short and small, thickly coated with long fine hair; legs long and slim, hind femora with rows of very numerous, very closely-set spines and a single, much longer one at distal end; wings long, rounded at apices, rather broad, reticulation close; discoidal cell in fore-wing traversed, its costal side about half the length of basal or distal sides; that of hind-wing with base at or very slightly proximal to level of arc, entire; sectors of arc

fused for a very short distance in fore-wing, for rather longer in the hind ; are lying between the first and second antenodal nervures ; $9\frac{1}{2}$ to $15\frac{1}{2}$ antenodal nervures, distal one incomplete ; only 1 cubital nervure in all wings ; *Cuii* in hind-wing arising from the posterior angle of discoidal cell, or more generally from the distal side of that cell ; discoidal field in fore-wing beginning with 3 rows of cells, its sides converging at wing-border ; no supplementary nervures to bridge ; subtrigone in fore-wing 3-celled ; 1 row of cells between *IRiii* and *Rspl* ; anal loop long, narrow, and with its borders running straight on to border of wing so that the apex remains open ; membrane and pterostigma moderately large. Abdomen relatively enormously dilated at segments 1 to base of 3 (as in *Orthetrum sabina*), then abruptly contracted and very slim and cylindrical

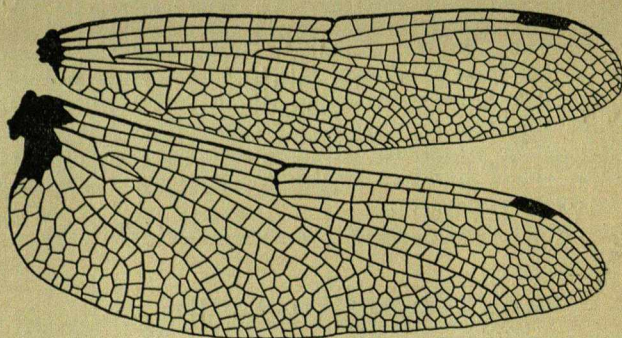


Fig. 113.—Wings of *Zyxomma petiolatum* Rambur, male.

to the end. Anal appendages : superiors very long, slim, and sinuous, acuminate at apex. Genitalia small and inconspicuous, hamules with long hooks but small base ; vulvar scales moderately large, bifid ; borders of segment 8 not dilated in female.

Genotype, *Zyxomma petiolatum* Rambur.

Distribution.—Africa, Seychelles, S. Asia, Sundaic Archipelago, Philippines, New Guinea, and Australia. Only one species is found within our limits, and this is widely spread throughout INDIA, CEYLON, and BURMA. Species of the genus are crepuscular in habits, emerging from their retreat shortly before dusk and flying till the darkness conceals them. They breed in small stagnant ponds, tanks, and wells, and may be seen in the latter during the daytime flying round and round close over the water where they exist in an artificial twilight.

519. *Zyxomma petiolatum* Rambur. (Fig. 113.)

Zyxomma petiolatum Rambur, Ins. Névrolog. p. 30, pl. ii, fig. 4 d (1842); Hagen, Verh. zool.-bot. Ges. Wien, vol. viii, p. 479 (1858); Brauer, ibid. vol. xvii, p. 287 (1867); id., ibid. vol. xviii, p. 712 (1868); Selys, Mitt. Mus. Dresden, p. 293 (1878); id., C. R. Soc. Ent. Belg. (7. vii. 1888); Kirby, Trans. Zool. Soc. Lond. vol. xii, p. 301, pl. lvii, fig. 10 (1889); id., Cat. Odon. p. 35 (1890); Selys, Ann. Mus. Civ. Genova, vol. xxx, p. 439 (1891); Kirby, J. Linn. Soc., Zool. vol. xxiv, p. 554 (1893); id., Ann. Mag. Nat. Hist. (6) vol. xiv, p. 19 (1894); Laidlaw, Proc. Zool. Soc. Lond. part 1, p. 64 (1902); Martin, Mission Pavie, Zool. p. 7 (sep.) (1904); Tillyard, Proc. Linn. Soc. N.S.W. vol. xxxi, p. 480 (1906); Van der Weele, Nova Guinea, Zool. vol. v, p. 386 (1909); Ris, Ann. Soc. Ent. Belg. vol. lv, p. 254 (1911); id., Cat. Coll. Selys, fasc. xv, xvi, pp. 901, 903-905, 1219 (1913, 1916); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvii, pp. 256, 257 (1920); id., Rec. Ind. Mus. vol. xxvi, pp. 428, 442 (1924); Laidlaw, Spolia Zeylanica, vol. xii, p. 350 (1924); id., J. F.M.S. Mus. vol. xvi, pp. 228, 240 (1930); Fraser, Rec. Ind. Mus. vol. xxxiii, p. 446 (1931); Lieftinck, Treubia, vol. xiv, pp. 422, 423 (1934).

Male.—Abdomen 37-42 mm. Hind-wing 32-35 mm.

Head: labium pale yellow; labrum pale ochreous; face and frons pale olivaceous, darkening above but variable, and usually dark reddish-brown margined with bright golden-yellow below in front; eyes brilliant emerald-green during life; vesicle dark reddish-brown; occiput very small, olivaceous. *Prothorax* and *thorax* chocolate-brown, paling at sides, unmarked. *Legs* pale reddish-brown or ochreous. *Wings* hyaline, but in full adult age becoming more or less deeply enfumed with brown and with apices dark brown to slightly proximal of inner end of pterostigma which is dark blackish-brown; nodal index $\frac{6-10\frac{1}{2}}{9-8} \mid \frac{10\frac{1}{2}-7}{8-8}$; other details of venation

as for genus; membrane blackish-brown, paler at attached border, where the base of wings is variably dark reddish-brown, usually to as far out as the first antenodal nervure except in the basal space which is hyaline. *Abdomen* reddish-brown of variable shades, darkening to black at end of segments; sides of segments 1 to 3 pale brown with sutures finely outlined in dark brown to black. *Anal appendages* reddish-brown; superiors changing from brown to black at apices, long and slender, as long as segments 9 and 10 taken together.

Female.—Abdomen 37-42 mm. Hind-wing 32-38 mm.

Exactly similar to the male save for sexual characters; *wings* usually more broadly dark reddish-brown at apices (in one female from the Laccadives this apical marking extends as far proximal as two cells beyond pterostigma or to about one-fourth the length of wings). *Anal appendages* rather long and slim; vulvar scale triangular, deeply bifid.

Distribution.—Occurs throughout INDIA, CEYLON, and



BURMA save in desert areas, but not found above 3,000 ft. I have specimens from Madras, Coorg, Poona, Bombay, Kalar, Nilgiris, and Laccadive Islands. Mr. C. A. Souter found it swarming in these latter islands, where it appeared to have crowded out all other dragonflies. Its habits are given under the description of the genus. The shape of the anal loop, and of the abdomen, together with the broad brown apices of the wings, will serve to distinguish this species from all other dragonflies.

Rambur's *type*, in the Selys collection, Brussels Museum, is from Bombay, where I found it common on the Parel Tank towards dusk.

Genus **THOLYMIS** Hagen. (Fig. 114.)

Tholymis Hagen, Stett. Ent. Zeit. vol. xxviii, p. 221 (1867); Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, pp. 365, 712 (1868); Kirby, Trans. Zool. Soc. Lond. vol. xii, pp. 258, 265 (1889); id., Cat. Odon. p. 1 (1890); Calvert, Biol. C. Amer., Neur. pp. 199, 219 (1905-1906); Förster, Jber. Mannheim, vols. lxxi, lxxii, p. 3 (sep.) (1906); Ris, Cat. Coll. Selys, fascs. ix, xv, pp. 35, 911, 912 (1909, 1913); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvii, pp. 253, 254 (1920).

Dragonflies of rather large size and robust build, coloured ochreous and reddish and with wings partly coloured or opalescent. Head relatively large; eyes broadly contiguous; frons narrow, rounded, and without distinct crest; sulcus shallow; vesicle broad, flattened, and slightly rounded. Prothorax with a very small posterior lobe; thorax broad, robust; legs long and slim; hind femora with variable armature in the species. Wings moderately long and broad, reticulation close; discoidal cell in fore-wing with costal side about one-third the length of basal or distal, traversed; that of hind-wing entire, its base very slightly proximal to level of arc; sectors of arc with a long fusion in both wings; arc lying between the first and second antenodal nervures; $10\frac{1}{2}$ or $11\frac{1}{2}$ antenodal nervures, distal one incomplete; 1 cubital nervure in all wings; no supplementary nervures to bridge; *Cu*_{ii} arising from the posterior angle of discoidal cell in hind-wing or slightly removed from it; discoidal field in fore-wing beginning with 3 rows of cells, its sides widely divergent at wing-border; 2 rows of cells between *IR*_{iii} and *R*_{spl}; sub-trigone in fore-wing 3- or 4-celled; anal loop with its borders running on to wing-border so that its apex is open as in genus *Zygomma*, long, narrow, distal side obtusely angulated; pterostigma rather short, that of hind-wing the shorter; membrane narrow. Abdomen rather broad at base and tapered gradually from there to the end; segment 8 in the female not

dilated at sides. Genitalia : that of male small and inconspicuous, hamules with well-developed hooks but small base, lamina hood-shaped, projecting ; lobe prolonged, constricted at base ; vulvar scales large, deeply cleft into small leaf-like triangular plates ; ninth ventral plate strongly ribbed medially, elongate and narrowly oval, with sides raised to enclose two deep longitudinal grooves, with apex completely overhanging segment 10.

Genotype, *Libellula tillarga* Fabricius.

Distribution.—Tropical and Neotropical ; only a single species known from within our limits. Species of this genus

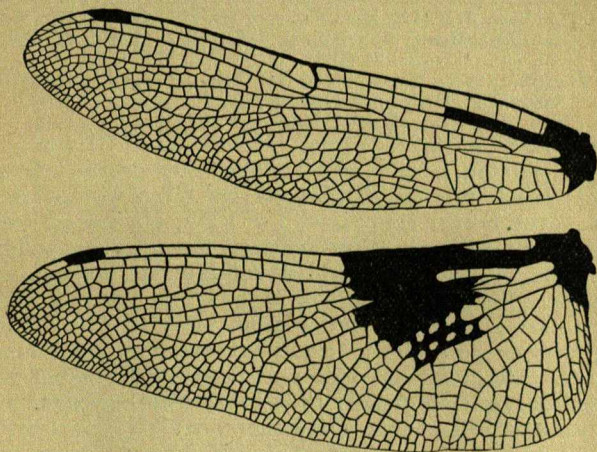


Fig. 114.—Wings of *Tholymis tillarga* (Fabr.), male.

are crepuscular in habit, appearing on the wing shortly before dusk and flying long after dark ; they frequently come to light and lie up under heavy shade in scrub- or bamboo-jungle during the day. All breed in marshes or weedy tanks.

520. *Tholymis tillarga* (Fabricius). (Fig. 114.)

- Libellula tillarga* Fabricius, Ent. Syst. Suppl. p. 285 (1798) ;
 Burmeister, Handb. Ent. vol. ii, p. 852 (1839) ; Rambur, Ins.
 Névrof. p. 39 (1842) ; Hagen, Verh. zool.-bot. Ges. Wien,
 vol. viii, p. 479 (1858) ; Selys, Maillart, Réunion, part 2, p. 34
 (1862) ; Calvert, Trans. Amer. Ent. Soc. vol. xxv, p. 69 (1898).
Libellula pallida Palisot de Beauvais, Ins. Afr. et Amér. p. 171,
 pl. ii, fig. 2 (1805).
Libellula bimaculata Desjardins, Ann. Soc. Ent. France, vol. iv,
 p. iv (1835).
Pantala tillarga Brauer, Verh. zool.-bot. Ges. Wien, vol. xiv, p. 162
 (1864).



- Distribution*.—Throughout INDIA, CEYLON, and BURMA and extending throughout southern Asia to Australia and Oceania, and westwards to the whole of tropical Africa and Madagascar. Its habits are those described under the

genus ; when in flight over water and viewed from above the opalescent spots on the hind-wings are lit up by the reflection of the sky and glow with extraordinary intensity ; as dusk falls only these spots can be observed moving swiftly round the borders of the tanks. The imagos may be beaten up in numbers from the surrounding jungle during the day. A common insect and found almost all the year round. The brown fascia and opalescent white spot on hind-wing will serve to identify it from all other species of Odonata.

The *type* is apparently lost ; specimens of both sexes are found in all national collections.

Genus **PANTALA** Hagen. (Fig. 115.)

Pantala Hagen, Syn. Neur. Amer. p. 141 (1861) ; Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, pp. 364, 713 (1868) ; MacLachlan, Proc. Zool. Soc. Lond. part 2, p. 85 (1877) ; Kirby, Trans. Zool. Soc. Lond. vol. xii, pp. 258, 265 (1889) ; id., Cat. Odon. p. 2 (1890) ; Calvert, Proc. Calif. Acad. (2) vol. iv, p. 471 (1895) ; id., Biol. C. Amer., Neur. pp. 203, 307 (1905-1906) ; Förster, Jber. Mannheim, vols. lxxi, lxxii, p. 4 (sep.) (1906) ; Ris, Cat. Coll. Selys, fascs. ix, xv, pp. 34, 915-917 (1909, 1913) ; Fraser, J. Bombay Nat. Hist. Soc. vol. xxvii pp. 49, 50 (1920).

Libelluline dragonflies of rather large size and robust build, coloured ochreous or reddish and with uncoloured wings.

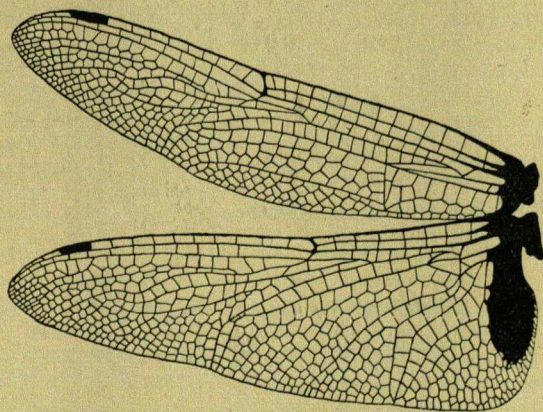


Fig. 115.—Wings of *Pantala flavescens* (Fabr.), male.

Head large ; eyes rather broadly contiguous ; frons broad and projecting and presenting two oval flat surfaces anteriorly separated by a deep sulcus ; vesicle broad and depressed.

Female.—Abdomen 30–33 mm. Hind-wing 39–41 mm.

Very similar to the male, from which it differs in the following points :—Eyes olivaceous-brown above ; face vivid chrome-yellow without any reddish tinting. *Wings* often evenly and more or less deeply enfumed and always without the apical brown spot. *Abdomen* not constricted at segment 3, somewhat stouter and more robust, paler olivaceous laterally and without red colouring on dorsum. *Anal appendages* elongate, conical, as long as the male appendages ; vulvar scale as for genus.

Distribution.—Circumtropical and subtropical ; widely and commonly distributed throughout the whole of INDIA, CEYLON, and BURMA to as far north as Tibet. Vast numbers of larvæ may be found breeding in marshes and weedy tanks, especially in submontane areas and among the foothills ; they emerge towards the end of September and commence a migratory flight which may last right on into November. Specimens of this very common insect are found in all national and private collections.

The *type* has been lost.

Genus CAMACINIA Kirby.

Camacinia Kirby, Trans. Zool. Soc. Lond. vol. xii, pp. 260, 266 (1889) ; Karsch, Berlin, Ent. Zeit. vol. xxxiii, pp. 356, 359 (1890) ; Kruger, Stett. Ent. Zeit. vol. lxiv, p. 253 (1903) ; Ris, Cat. Coll. Selys, fascs. ix, xv, pp. 36, 924, 925 (1909, 1913) ; Fraser, J. Bombay Nat. Hist. Soc. vol. xxvii, pp. 257, 258 (1920).

A small genus containing the largest known Libelluline dragonflies, characterized by their uniform ochreous or reddish-brown colouring and extensively coloured wings. Head large, with very broad and deep rounded labrum ; frons rounded, without well-defined crest, and with two flat oval surfaces in front separated by a deep sulcus in floor of frons ; vesicle high, surmounted by two small tubercles ; eyes but shortly contiguous ; occiput large. Prothorax with small posterior lobe ; thorax very robust ; legs long, rather slim ; hind femora with rows of rather widely-spaced, robust, gradually lengthening spines ; mid-femora with much longer spines ; wings long, very broad towards base, pointed towards apex, more or less broadly coloured, reticulation very close ; discoidal cell in fore-wing with rather long costal side equal to half the basal or distal sides, filled with a network of cells ; that of hind-wing narrow, distal side markedly concave, base at level of arc, traversed several times ; sectors of arc separated from origins ; arc situated between first and second antenodal nervures ; very numerous antenodal nervures, distal one variable, complete or incomplete ; 1 to 6 cubital nervures in fore-wing, 2 in the hind ; *Cu₁* arising from posterior angle of discoidal cell

in hind-wing; discoidal field beginning with rows of 7 cells or more and filled with a close network of cells throughout, arranged in pleats of two columns of cells, its borders converging at wing-border; many supplementary nervures to bridge; subtrigone absent in fore-wing; all hypertrigones traversed; 1 to 4 rows of cells between *IRiii* and *Rspl*; anal loop very elongate, with prolonged narrow apex, strongly angulated on distal side; *Riii* and *IRiii* markedly undulated as in *Pantala*; pterostigma very long; membrane long and narrow. Abdomen relatively short, broad at base and tapered gradually to the end, dorsum strongly carinated; anal appendages of the usual Libelluline shape. Genitalia: male organs very small, lamina depressed, arched; hamules with tumid base and short, scarcely curled hook; lobe very short, rounded, constricted at base: in the female, borders of segment 8 not dilated; vulvar scales very small, separated by a shallow rounded notch; ninth ventral plate very tumid, and furnished with two small hooks at the distal third.

Genotype, *Neurothemis gigantea* Brauer.

Distribution.—INDIA, BURMA, Malaysia, Indo-China, the Philippines, Sundaic Archipelago, New Guinea, Australia, and south Pacific islands. Only one species has been reported from within our limits; the report of *C. harterti* from Sikkim is erroneous. Species of this genus are the giants of the subfamily Libellulinae and are extremely local and scarce; they breed in shallow stagnant waters, the male usually being found flying over the surface of such or perched for long intervals on some twig overhanging such pools. The females are more shy and are rarely caught except when they come to water to oviposit; meanwhile they appear to lie up in long grass and reeds near water.

522. *Camacinia gigantea* (Brauer).

Neurothemis gigantea Brauer, Verh.-Zool. bot. Ges. Wien, vol xvii, p. 8 (1867); id., ibid. vol. xviii, p. 717 (1868); Hagen, Stett. Ent. Zeit. vol. xxx, p. 94 (1869); Selys, Mitt. Mus. Dresden, p. 293 (1878); id., Ann. Mus. Civ. Genova, vol. xiv, p. 292 (1879).

Camacinia gigantea Kirby, Trans. Zool. Soc. Lond. vol. xii, p. 267 (1889); id., Cat. Odon. p. 2 (1890); Karsch, Ent. Nachr. vol. xvii, p. 42 (1891); Kirby, Ann. Mag. Nat. Hist. (6) vol. xiv, p. 112 (1894); Laidlaw, Proc. Zool. Soc. Lond. part 1, p. 65 (1902); Kruger, Stett. Ent. Zeit. vol. lxi, p. 105 (1902); Martin, Mission Pavie, Zool. p. 4 (sep.) (1904); Martin, Bull. Soc. Ent. Ital. vol. ix, p. 196 (1908); Ris, Cat. Coll. Selys, fasc. xv, pp. 925-927 (1913); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvii, pp. 258, 259 (1920); Laidlaw, J. F.M.S. Mus. vol. xvi, pp. 229, 240 (1930); Lieftinck, Treubia, vol. xiv, pp. 427-429 (1934).

Male.—Abdomen 32-37 mm. Hind-wing 45-53 mm.

Head: labium bright chrome-yellow; labrum and rest



of head dark reddish-brown ; eyes dark reddish-brown above, paler laterally and beneath, behind bright yellow. *Prothorax* and *thorax* dark ochreous or ferruginous. *Legs* reddish-brown. *Wings* dark burnt-brown from base to beyond node, this colour extending narrowly along costal border thereafter in the two first spaces to as far as apex and outer end of posterior border of wing ; in fore-wing outer border of opaque dark marking extending from costa, from about 6 to 12 cells distal of node, to posterior border of wing, which it meets at end of nervure *MA* ; in the hind-wing extending from a point roughly about half-way between node and pterostigma and reaching posterior border of wing at same point as in fore-wing. Wing distal to opaque area quite colourless ; pterostigma dark reddish-brown between black nervures ; membrane

dark reddish-brown ; nodal index variable	22-31	27-20
	22-18	17-21

base of wing very broad and filled with numerous rows of very small cells ; the opaque area with a steely bronzed reflex. *Anal appendages* and *genitalia* as for genus.

Female.—Abdomen 32-35 mm. Hind-wing 47-55 mm.

Similar to male in body colouring, and differing only in the colour and markings of wings and sexual characters. Body-colouring in some specimens more ochreous than reddish-brown. Wings with reticulation of wings more open and basal marking paler and more restricted ; in fore-wing confined to an area lying between costal border and cubital nervure and *MA*, expanding slightly at node, where it also deepens in tint to golden-yellow or light golden-brown and is then continued on to apex and posterior border along costa as in the male, but the apex enfumed to slightly promixal of outer end of pterostigma. Hind-wing similar to male, but discoidal cell also included in coloured area and, at the node, this area prolonged obliquely backwards and towards base of wing and broadening out to form a dark enfumed and golden-brown posterior border to wing which extends from level of node to tornal angle of wing, leaving a large clear uncoloured area between it and costal area of wing. (In the male this curved band can also be seen obscurely by viewing the wing by transmitted light.) Teneral males approximate to colouring of females ; wings are rich golden-amber from base to about half-way from node to pterostigma, with a broad, irregular, opaque brown border to coloured area, which broadens towards posterior border of wing and is then continued more narrowly along that border to tornal angle.

Distribution.—N. INDIA, BENGAL, ASSAM, and BURMA ; Malaysia, Indo-China, Java, Sumatra, Borneo, New Guinea, and the Philippines. It is an extremely rare insect in India ; I have a single teneral male from Rangoon which I took in.

1909, and from that time I received no specimens until 1931, when Mr. Antram found it locally common at Nowgong, Assam, some of these specimens being the largest *Libellulines* ever taken.

Type in the Vienna Museum ; five males and a female in the Selys collection, Brussels Museum, eight males and two females in the British Museum, fifteen males and one female in the Author's collection.

Genus **RHYOTHEMIS** Hagen. (Fig. 116.)

Rhyothemis Hagen, Stett. Ent. Zeit. vol. xxviii, p. 232 (1867) ; Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, pp. 364, 714 (1868) ; Selys, Mitt. Mus. Dresden, p. 293 (1878) ; Kirby, Trans. Zool. Soc. Lond. vol. xii, pp. 258, 269 (1889) ; id., Cat. Odon. p. 5 (1890) ; Karsch, Berlin Ent. Zeit. vol. xxxiii, p. 351 (1890) ; Kruger, Stett. Ent. Zeit. vol. lxiii, p. 87 (1902) ; Förster, Jber. Mannheim, vols. lxxi, lxxii, p. 5 (sep.) (1906) ; Ris, Cat. Coll. Selys, fascs. ix, xv, pp. 36, 930-933 (1909, 1913) ; Fraser, J. Bombay Nat. Hist. Soc. vol. xxvi, pp. 928-930 (1920).

Libelluline dragonflies with body metallic-coloured and wings partly or wholly coloured black and golden-yellow

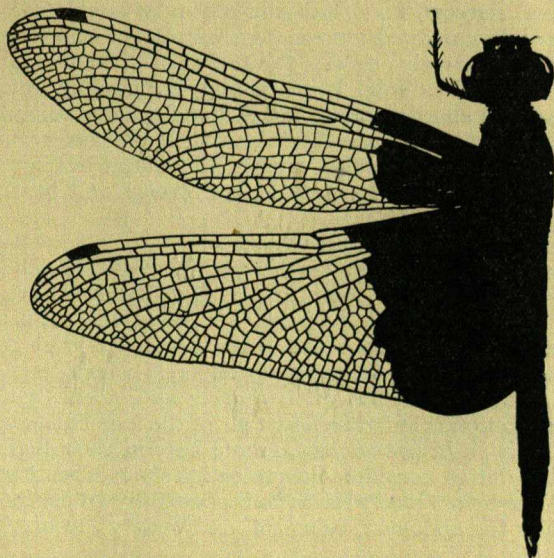


Fig. 116.—Wings of *Rhyothemis triangularis* Selys, male.

or steely blue-black. Head small ; eyes broadly contiguous ; frons rounded in both sexes, crest but slightly defined ;

vesicle large, broadly rounded. Prothorax with small posterior lobe; thorax narrow, small; legs long and slim; hind femora with rows of rather widely-spaced, very small spines and a single longer one at distal end; similar in the sexes. Wings variable, broad at base, pointed at apex, or long and moderately broad at base, varying in shape in the sexes of some species, where they are long and narrow in the male, short and very broad in the female; reticulation close; broadly marked with black and golden-amber or with steely blue-black; discoidal cell in fore-wing rather narrow, its costal side about half the length of basal or distal, traversed once or more; discoidal cell in hind-wing with base at level of arc, entire; sectors of arc separated at origin in fore-wing, shortly fused at origin in the hind; arc situated between the first and second antenodal nervures, often very proximal and opposite the first; $7\frac{1}{2}$ to $10\frac{1}{2}$ antenodal nervures, distal one incomplete; 1 cubital nervure to all wings; *Cu_{iii}* arising from posterior angle of discoidal cell in hind-wing; discoidal field beginning with 3 to 5 rows of cells but very irregular, its borders parallel or converging strongly at wing-border; no supplementary nervures to bridge; subtrigone in fore-wing absent or many-celled; 1 or 2 rows of cells between *IR_{iii}* and *R_{spl}*; anal loop long, narrow, its distal side abruptly angulated, distal end abruptly narrowed; pterostigma small; membrane large. Abdomen relatively short, markedly compressed in both sexes. Genitalia: lobe large, depressed, broadly rounded; hamules with short angulated base and strongly-curved hook; lobe narrowly spatulate. Female with borders of segment 8 not dilated; vulvar scales very small but projecting almost perpendicularly; ninth ventral plate keeled and broadening at the apical end.

Genotype, *Libellula phyllis* Sulzer.

Distribution.—Throughout the tropical regions from Africa to Oceania. Within our limits five species have been taken, but all save *R. variegata* are very local. Species of this genus are gregarious and occur usually in large colonies over marshy spots or large weedy tanks, in which they breed. Their flight is weak but often soaring and, when flying low, the wing-action is fluttering like that of the larger Lepidoptera. Some, such as *R. triangularis*, mimic bees in their flight, and probably derive considerable protection from birds from this fact. The imago rarely seems to become fully adult, the body, especially the abdomen, being soft and weakly chitinized quite late in life.

Key to Indian Species of Rhyothemis.

1. { Wings marked with black and amber-yellow 2.
 { Wings marked with black only, or with black and brown with metallic reflex .. 3.
2. { Wings widely different in the sexes; male with whole of wings tinted yellow, fore-wing with spots at node, discoidal cell, apex, and at middle of *Riii*; hind-wing with similar dark spots and two broad longitudinal basal bands. Female with broader, shorter wing; fore-wing hyaline from node to apex, basal half with broad black markings, hind-wing with broad irregular markings to as far distal as pterostigma, apex hyaline [(Linn.), p. 423.
variegata variegata
 { Wings closely similar in shape and markings in the sexes; male with apices of all wings opaque, a nodal spot in fore-wing and two short, broad, basal fasciae in hind-wing; all females with black apices to wings [p. 421.
phyllis phyllis (Sulzer),
3. { Only 1 row of cells between *IRiii* and *Rspl*. 4.
 { Two rows of cells between *IRiii* and *Rspl*; base of wings deep black, with steely blue reflex, up to discoidal cell in fore-wing, and nearly to node in the hind... [p. 427.
triangularis Kirby,
4. { Base of hind-wing in full adult without hyaline or paler bands; male with both wings completely uniform black except apex of fore-wing narrowly; female similar, but with apex of fore-wing hyaline up to a little proximal of pterostigma, and hind-wing up to pterostigma *plutonia* Selys, p. 426.
 { Base of hind-wing in adults with subhyaline narrow longitudinal bands; extreme apex of fore-wing in male and apices of all wings in female up to or nearly to pterostigma hyaline; a row of opaque spots along costal margin of both wings [p. 425.
obsolescens Kirby,

523. *Rhyothemis phyllis phyllis* (Sulzer).

Libellula phyllis Sulzer, Abgekürzte Gesch. der Ins. p. 169, pl. xxiv, fig. 2 (1776); Burmeister, Handb. Ent. vol. ii, p. 853 (1839); Rambur, Ins. Névropt. p. 42 (1842); Calvert, Trans. Amer. Ent. Soc. vol. xxv, p. 70 (1898).

Libellula quadropunctata Roemer, Genera Insectorum, p. 64, pl. xxiv, fig. 2 (1789).

Libellula vittata Weber, Observat. Ent. p. 105 (1801).

Celythemis phyllis Brauer, Novara, p. 104 (1866).

Celithemis phyllis Brauer, Verh. zool.-bot. Ges. Wien, vol. xvii, p. 288 (1867).

Rhyothemis phyllis Hagen, Stett. Ent. Zeit. vol. xxviii, p. 232 (1867); Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, p. 715 (1868); Selys, Mitt. Mus. Dresden, p. 293 (1878); Albarda,

Veths. Midden Sumatra, Neur. p. 3 (1881); Kirby, Trans. Zool. Soc. Lond. vol. xii, p. 270 (1889); id., Cat. Odon. p. 5 (1890); Selys, Ann. Mus. Civ. Genova, vol. xxx, p. 443 (1891); Karsch, Ent. Nachr. vol. xvii, p. 45 (1891); Kirby, J. Linn. Soc., Zool. vol. xxiv, p. 549 (1893); Laidlaw, Proc. Zool. Soc. Lond. part 1, p. 65 (1902); Kruger, Stett. Ent. Zeit. vol. lxiii, p. 104 (1902); Martin, Mission Pavie, Zool. p. 4 (sep.) (1904); Needham, Proc. U.S. Nat. Mus. vol. xxvii, p. 700, pl. xli, figs. 1, 2 (1904); Ris, Ann. Soc. Ent. Belg. vol. lv, p. 254 (1911); id., Cat. Coll. Selys, fasc. xv, pp. 931, 938-940 (1913); Fraser, J. Nat. Hist. Soc. Siam, vol. iii, p. 459 (1919); id., J. Bombay Nat. Hist. Soc. vol. xxvi, pp. 929, 931, 932 (1920); id. J. Siam. Soc., Nat. Hist. Suppl. vol. vii, p. 86 (1927); Laidlaw, J. F.M.S. Mus. vol. xvi, pp. 229, 240 (1930); Lieftinck, Treubia, vol. xiv, p. 425 (1934).

Male.—Abdomen 24-27 mm. Hind-wing 35-37 mm.

Head: labium pale whitish-yellow, middle lobe black; labrum black; clypeus and lower border of frons creamy-yellow; frons and vesicle very dark metallic green; eyes dark reddish-brown above; occiput black. *Prothorax* black; *thorax* dark metallic green. *Legs* and *abdomen* entirely black. *Wings* palely tinted throughout with yellow, all apices blackish-brown to within one or two cells of pterostigma; a black nodal spot variable in size limited to node or covering two or more cells in costal and subcostal spaces, this spot absent or reduced in hind-wing, at the base of which are two very broad black fasciæ with dark metallic blue reflex extending distally to apex of discoidal cell and distal border of anal loop, the anterior extending from costa to end of membrane and the posterior lying within tornal angle but not reaching the border of wing; these two fasciæ lying enclosed in a large opaque chrome-yellow spot which separates the two fasciæ and extends distally for the same distance. Membrane very pale brown; pterostigma blackish-brown. *Anal appendages* rather long, slim, slightly sinuous, of the usual Libelluline shape. *Genitalia* as for genus.

Female.—Abdomen 22-24 mm. Hind-wing 34-35 mm.

Exactly similar to male save for sexual characters. Pterostigma shorter than in male; nodal index in both sexes $\frac{11-11\frac{1}{2}}{11-8} \mid \frac{9\frac{1}{2}-11}{7-13}$. *Anal appendages* black, shortly conical. *Genitalia* as for genus.

Distribution.—From BURMA only within our faunal area; the species has been reported from Ceylon, but this is certainly an error, and the pair in the Selysian collection labelled as such have been labelled in error. I have specimens from Mergui, Lower Burma; the species has also been reported from Rangoon, Mandalay, Teinzo, Bhamo, and Palone. From Burma it extends throughout S. Asia, Java, Sumatra, to Borneo. The similarity of the sexes and the markings of the wings



will serve to distinguish this species from *R. variegata*, the only one which it at all resembles.

The *type* appears to have been lost ; specimens of both sexes in all national collections and in the British, Indian, and Pusa Museums.

524. *Rhyothemis variegata variegata* (Linnæus).

Libellula variegata Linnæus, *Amœnitates Acad.* vol. vi, p. 412 (1763); Linnæus, *Syst. Nat.* ed. xii, vol. ii, p. 904 (1766); Rambur, *Ins. Névro-p.* p. 44 (1842); Hagen, *Stett. Ent. Zeit.* vol. vi, p. 156 (1845); id., *Verh. zool.-bot. Ges. Wien*, vol. viii, p. 480 (1858).

Libellula marcia Drury, *Ill. Exot. Ins.* vol. ii, pl. xlv, fig. 3, p. 83 (1773); Rambur, *Ins. Névro-p.* p. 42 (1842).

Libellula indica Fabricius, *Spec. Ins.* vol. i, p. 521 (1781); id., *Ent. Syst.* vol. ii, 1, p. 376 (1793); Burmeister, *Handb. Ent.* vol. ii, p. 853 (1839); Calvert, *Trans. Amer. Ent. Soc.* vol. xxv, p. 70 (1898).

Libellula histrio Fabricius, *Mantissa Insect.* vol. ii, p. 237 (1787).

Libellula celestina Olivier, *Encycl. Méth.* vol. vii, p. 569 (1792).

Libellula murcia Fabricius, *Ent. Syst.* vol. ii, p. 376 (1793); Burmeister, *Handb. Ent.* vol. ii, p. 853 (1839); Calvert, *Trans. Amer. Ent. Soc.* vol. xxv, p. 70 (1898).

Rhyothemis variegata Hagen, *Stett. Ent. Zeit.* vol. xxviii, p. 232 (1867); Brauer, *Verh. zool.-bot. Ges. Wien*, vol. xviii, p. 715 (1868); Kirby, *Cat. Odon.* p. 5 (1890); Selys, *Ann. Mus. Civ. Genova*, vol. xxx, p. 440 (1891); Kirby, *J. Linn. Soc.*, Zool. vol. xxiv, p. 549 (1893); Kruger, *Stett. Ent. Zeit.* vol. lxiii, p. 102 (1902); Martin, *Mission Pavie*, Zool. p. 4 (sep.) (1904); Laidlaw, *Rec. Ind. Mus.* vol. viii, p. 338 (1914); id., *Spolia Zeylanica*, vol. xii, p. 350 (1924).

Rhyothemis marcia Hagen, *Stett. Ent. Zeit.* vol. xxviii, p. 232 (1867); Kirby, *Cat. Odon.* p. 5 (1890); id., *Proc. Zool. Soc. Lond.* p. 203 (1891).

Rhyothemis murcia Brauer, *Verh. zool.-bot. Ges. Wien*, vol. xviii, p. 715 (1868).

Rhyothemis variegata variegata Ris, *Cat. Coll. Selys*, fasc. xv, pp. 931, 935, 936 (1913); Fraser, *J. Bombay Nat. Hist. Soc.* vol. xxvi, pp. 929-931 (1920); id., *Rec. Ind. Mus.* vol. xxvi, pp. 426, 443 (1924); id., *ibid.* vol. xxxiii, p. 446 (1931).

Rhyothemis phyllis phyllis Fraser, *Rec. Ind. Mus.* vol. xxvi, pp. 426, 443 (1924).

Male.—Abdomen 23-25 mm. Hind-wing 33-36 mm.

Head, *thorax*, and *abdomen* coloured similarly to *R. phyllis phyllis*; *wing* markings differing as follows:—Fore-wing: apical marking usually slightly less extensive, nodal spot more extensive, often extending posteriorly to as far as *Rv*+*v*, an additional spot at the discoidal cell involving the base of that structure, and distal ends of cubital and hypertrigonal spaces, occasionally small spots at proximal end of subcostal space and another at origin of sectors of arc; hind-wing with basal fasciæ more extensive, extending distally to slightly beyond discoidal cell and well beyond anal loop to the level of



Cuii; the posterior border of posterior fascia with a small rounded notch, beyond which the fascia usually meets border of wing; in addition, a large spot at middle of *IRiii* (sometimes present in fore-wing also), another similar spot at middle of *MA*, and an occasional spot between this last and posterior fascia. All these markings subject to considerable variation. *Anal appendages* and *genitalia* similar to last species.

Female.—Abdomen 20–22 mm. Hind-wing 28–37 mm.

Head, body, and thorax similar to male, *wings* differing in shape and markings as follows:—Fore-wing with apical half from level of node hyaline and uncoloured, basal half tinted with golden-yellow, and marked with blackish-brown as follows:—A stripe which begins in subcostal space extends gradually into costal space and ends abruptly at node, where it is broadly confluent with a broad fascia which runs posteriorly nearly to border of wing and with outer border somewhat oblique outwards and backwards; an irregularly triangular spot with centre at base of discoidal cell extending distally to become confluent with the transverse fascia and narrowing proximally to as far as arc. Hind-wing very broad and short, its apex from about inner end of pterostigma hyaline and uncoloured, rest of wing tinted with golden-amber and broadly marked with blackish-brown as follows:—Two broad basal fasciæ as in male, but which extend distally to level of node, where they are more or less broadly connected by a short transverse stripe descending from the node; between node and pterostigma a very broad quadrate fascia which is narrowly connected to basal mark by an isthmus at centre of wing and which bears a small round, hyaline, yellow-tinted spot at its middle; pterostigma blackish-brown, much smaller than in male, barely half the size. *Anal appendages* and *genitalia* similar to last species.

Andromorphic female.—In addition to the heteromorphic female described, andromorphic forms are frequently met with which, apart from sexual differences, do not differ in any way from the male.

Distribution.—INDIA, CEYLON, BURMA, and Malaysia. This species is well represented in all national collections, including those of the British Museum and Indian Museum, as well as in the Pusa collection. A good deal of variation is met with in the dark markings, especially in the male and andromorphic females, heteromorphic females varying hardly at all. This species is locally very common and, where found, is usually in swarms; I have seen it in countless numbers hovering over weedy tanks around Bangalore, and it is very common throughout Mysore.

The *type*, a female, has apparently been lost.

525. *Rhyothemis obsolescens* Kirby.

Rhyothemis obsolescens Kirby, Trans. Zool. Soc. Lond. vol. xii. p. 321 (1889); id., Cat. Odon. p. 6 (1890); Kruger, Stett. Ent. Zeit. vol. lxxiii, p. 93 (1902); Ris, Cat. Coll. Selys, fasc. xv, pp. 933, 958, 959 (1913); Fraser, J. Bombay Nat. Hist. Soc. vol. xxx, p. 48 (1924); Laidlaw, J. F.M.S. Mus. vol. xvi, pp. 229, 240 (1930).

Rhyothemis curiosa Selys, Ann. Mus. Civ. Genova, vol. xxvii, p. 451 (1889); Kirby, Cat. Odon. p. 6 (1890); id., J. Linn. Soc., Zool. vol. xxiv, p. 549 (1893); Laidlaw, Proc. Zool. Soc. Lond. part 1, p. 65 (1902); Kruger, Stett. Ent. Zeit. vol. lxxiii, p. 452 (1902); Laidlaw, Rec. Ind. Mus. vol. viii, pp. 338, 339 (1914).

Rhyothemis curiosa var. *transversa* Selys, Ann. Mus. Civ. Genova, vol. xxvii, p. 452 (1889).

Rhyothemis curiosa var. *apicalis* Selys, Ann. Mus. Civ. Genova, vol. xxvii, p. 452 (1889).

Rhyothemis sp. Laidlaw, Rec. Ind. Mus. vol. viii, p. 338 (1914).

Male.—Abdomen 17–18 mm. Hind-wing 23–26 mm.

Head: labium pale whitish-brown; labrum black; face and lower part of frons creamy-white; upper part of frons in front and above and vesicle dark metallic bluish-green; occiput black; eyes dark reddish-brown above, paler below.

Prothorax blackish-brown; *thorax* dark metallic green, almost black. *Legs* black. *Wings* blackish-brown, throughout mottled and striated with darker shades and, rarely, with apex of fore-wing partly hyaline and uncoloured; antenodal nervures heavily irrorated, forming a chain of diamond-shaped spots along costal margins of wings; postnodal nervures less so; alternating dark fasciæ and pale diffuse stripes obscurely seen at base of hind-wing and a clear triangular area immediately after node in all wings; pterostigma blackish-brown;

membrane palest brown; nodal index $\frac{5-7\frac{1}{2}}{6-5} \mid \frac{7\frac{1}{2}-6}{5-6}$; discoidal field beginning with 5 rows of cells; discoidal cell of fore-wing 3-celled. *Abdomen* black. *Anal appendages* and *genitalia* similar to last species.

Female.—Abdomen 16–17 mm. Hind-wing 22–24 mm.

Resembles the male in colour and markings very closely; differs as follows:—*Wings* shorter and broader, apices of all hyaline and colourless, fore-wing nearly to proximal end of pterostigma, hind-wing only at extreme tip, but the area in both fore- and hind-wings variable; other markings of wings similar to male and with a purplish or bluish-steely reflex. *Abdomen* shorter and more cylindrical. *Anal appendages* shortly conical, black; vulvar scale very short, not projecting.

Distribution.—From within our limits reported only from ASSAM and BURMA. There is a male from Dejoo, Assam, in Dr. Laidlaw's collection, and three males in my own collection from King Island, Mergui, Lower Burma. I have a pair from Warin Ubon, N.E. Siam. The species extends through



Malaysia to Borneo and south to Sumatra. The dark blackish-brown wings, mottled and streaked with darker spots and stripes, will serve to distinguish this species from others of the genus, *R. plutonia* being the only one with which it may be confused, but this latter is a much larger species and has the wings uniformly coloured.

The *type* is in the British Museum.

526. *Rhyothemis plutonia* Selys.

Rhyothemis plutonia Selys, Ann. Soc. Ent. Belg. vol. xxvii, p. 89 (1883); Kirby, Cat. Odon. p. 6 (1890); Selys, Ann. Mus. Civ. Genova, vol. xxx, p. 445 (1891); Martin, Mission Pavie, Zool. p. 4 (sep.) (1904); Ris, Cat. Coll. Selys, fasc. xv, pp. 932, 956 (1913); Laidlaw, Rec. Ind. Mus. vol. viii, p. 338 (1914); Fraser, J. Nat. Hist. Soc. Siam, vol. iii, p. 459 (1919); id., J. Bombay Nat. Hist. Soc. vol. xxvi, p. 929 (1920); id., ibid. vol. xxvii, p. 48 (1920); Laidlaw, J. F.M.S. Mus. vol. xvi, p. 229 (1930).

Male.—Abdomen 20–22 mm. Hind-wing 31–36 mm.

Head: labium, labrum, face, and lower border of frons black, anteclypeus paler or brownish; frons and vesicle dark metallic bluish-green; occiput black; eyes dark reddish-brown above, violaceous below. *Prothorax* blackish-brown; *thorax* dark metallic green. *Legs* and *abdomen* black. *Wings* uniform blackish-brown with a dark blue or violaceous reflex; antenodal nervures with darker irroration around them and cell-middles generally paler throughout wings. Apices variably hyaline and uncoloured, usually only a few cells so at extreme tip of fore-wing or all wings entirely opaque, more rarely fore-wing hyaline up to outer end of pterostigma; membrane black; pterostigma blackish-brown. *Anal appendages* black, of the usual Libelluline shape. *Genitalia* not differing markedly from the previous species.

Female.—Abdomen 19–21 mm. Hind-wing 29–32 mm.

Differs only from the male in sexual characters and by the apices of all wings being uncoloured and hyaline: rarely only extreme apex of fore-wing hyaline, but usually this wing hyaline up to inner end of pterostigma or as far as half-way from that organ to node, whilst the hind-wing varies from a few cells at apex to as far proximal as inner end of pterostigma. *Anal appendages* and *genitalia* similar to last species.

Distribution.—The type is a male and, together with a female, came from BENGAL; another male is from Teinzo, BURMA. I have a number of both sexes from Maymyo, UPPER BURMA, and from Nowgong, ASSAM. Variability is confined to the size of the hyaline area at apices of wings and also to the shape of the wings in the male; as a rule the wings of the female are both broader and shorter than in the male, and this

appears to be copied in the latter sex by occasional specimens with short and broad wings. The habits and habitats of this species are similar to those of *R. variegata*, but it never occurs in such numbers.

The type is in the Selys collection in the Brussels Museum.

527. *Rhyothemis triangularis* Kirby. (Fig. 116.)

Rhyothemis triangularis Kirby, Trans. Zool. Soc. Lond. vol. xii, p. 319 (1889); id., Cat. Odon. p. 6 (1890); Kruger, Stett. Ent. Zeit. vol. lxiii, p. 96 (1902); Ris, Jenaische Denkschr. vol. xiii, p. 343 (1908); id., Ann. Soc. Ent. Belg. vol. lv, p. 255 (1911); id., Cat. Coll. Selys, fasc. xv, pp. 933, 962, 963 (1913); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvii, pp. 48, 49 (1920); id., Rec. Ind. Mus. vol. xxvi, pp. 426, 443, 444, text-fig. 1 (1924); Laidlaw, Spolia Zeylanica, vol. xii, p. 350 (1924); id., J. F.M.S. Mus. vol. xvi, pp. 229, 240 (1930); Fraser, Rec. Ind. Mus. vol. xxxiii, p. 446 (1931); Lieftinck, Treubia, vol. xiv, p. 425 (1934).

Rhyothemis lankana Kirby, J. Linn. Soc., Zool. vol. xxiv, p. 549 (1893).

Rhyothemis bipartita Tillyard, Proc. Linn. Soc. N.S.W. vol. xxxi, p. 483 (1906).

Male.—Abdomen 16–20 mm. Hind-wing 24–29 mm.

Head: labium, labrum, and face black; frons and vesicle dark green or metallic greenish-blue; occiput black; eyes blackish-brown above, paler brown or lilaceous below. *Prothorax* blackish-brown; *thorax* dark metallic green. *Legs* *abdomen*, and *anal appendages*, entirely black. *Wings* hyaline enfumed with pale brown, uniform in tint or gradually deepening towards apices (absent in teneral examples), bases of all black with dark metallic blue reflex, in fore-wing as far distal as second or third antenodal nervure, in median and cubital spaces nearly to discoidal cell and between origins of sectors of arc; finally, in anal field to as far as subtrigone. In hind-wing as far distal as fourth or fifth antenodal nervure, and thence in a ragged line to posterior border of wing near the region of apex of anal loop; pterostigma dark reddish-brown, very short; membrane black. *Genitalia* as for genus.

Female.—Abdomen 16–17 mm. Hing-wing 24–28 mm.

Apart from the sexual organs, indistinguishable from the male; hind-wing often rather broader and pterostigma always shorter. *Genitalia* similar to last species.

Distribution.—CEYLON, WESTERN GHATS of INDIA, COORG and ASSAM; Malaysia, Sumatra, Java, and Borneo. I have taken it in profusion over most tanks in S. Coorg, especially around Viranjpet, and have seen a few specimens over a tank near Palghat, S. Malabar. Mr. Bainbrigge Fletcher has taken a few specimens at Margherita, Assam; Ceylon forms are not uncommon around Kandy and Udugama. The limitation of the opaque black area to base of wings will serve

to distinguish this species from *plutonia* and other black-winged species.

The type is from Borneo ; Kirby's type of *lankana*, a teneral example of *triangularis*, is from Ceylon. Both are now in the British Museum.

Genus **HYDROBASILEUS** Kirby. (Fig. 117.)

Hydrobasileus Kirby, Trans. Zool. Soc. Lond. vol. xii, pp. 258, 266 (1889) ; Karsch, Berlin Ent. Zeit. vol. xxxiii, p. 349 (1890) ; Ris, Cat. Coll. Selys, fascs. ix, xvi, pp. 36, 965, 966 (1909, 1913) ; Fraser, J. Bombay Nat. Hist. Soc. vol. xxvii, pp. 55, 56 (1920).

Dragonflies of large size and robust build with wings partly coloured and body ochreous or ferruginous. Head large ;

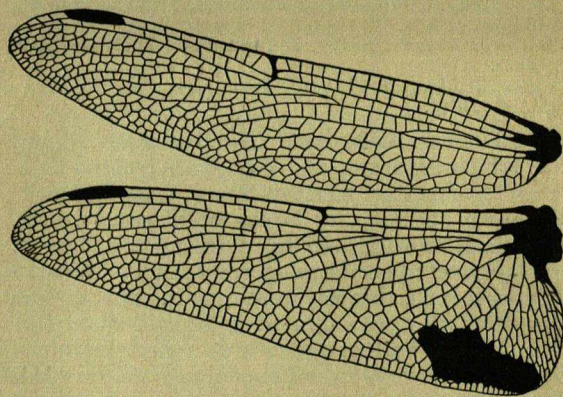


Fig. 117.—Wings of *Hydrobasileus croceus* (Brauer), male.

eyes broadly contiguous ; frons prominent, but without sharply defined crest, sulcus deep ; vesicle high, rather deeply notched or with two points at apex. Prothorax with small posterior lobe ; thorax robust ; legs rather long and slim : hind femora with numerous small, equally-sized, closely-set spines or distal ones slightly more robust ; abdomen comparatively short, broad at base and tapered gradually to the anal end. Genitalia of male : lamina narrow, depressed, deeply arched ; hamules without definite base and with robust, elongate, nearly straight hook projecting markedly ; lobe unguate, obtuse at apex. Female : borders of segment 8 not dilated ; vulvar scales two small, narrowly oval, widely diverging leaf-like plates ; ninth ventral plate tumid and carinated in distal half, furnished with two small hooks near the middle. Wings long and broad, especially at base,



somewhat pointed at apices; reticulation close; discoidal cell in fore-wing narrow, traversed once or twice, costal side less than half the length of basal or distal sides; discoidal field of hind-wing entire, its base at level of arc; sectors of arc fused for a short distance in fore-wing, for a much longer distance in hind-wing; arc situated between the first and second antenodal nervures; $12\frac{1}{2}$ to $18\frac{1}{2}$ antenodal nervures, distal one incomplete; 1 cubital nervure in all wings; *Cu₁* in hind-wing arising from posterior angle of discoidal cell; discoidal field beginning with a row of 3 or 4 cells and then continued as rows of 3 cells, its borders parallel to wing-border; no supplementary nervures to bridge; no defined subtrigone in fore-wing; 2 rows of cells between *IR₁* and *Rs₁*; anal loop truncate, squared at distal end, apical and distal angles equal; pterostigma and membrane large.

Genotype, *Tramea quadrivittata* Hagen.

Distribution.—INDIA, BURMA, CEYLON; Malaysia, Indo-China, Sumatra, Java, New Guinea, Borneo, Formosa, Philippines, and Australia. Only a single species found within our limits. Species of this genus breed in weedy tanks and lakes and, on first emergence, are found soaring above jungle well away from their watery habitat; in such situations large numbers may be seen in company with other species of Odonata flying at a height of one to two hundred feet. On attaining full adult age they return to the tanks and are then found flying and hovering over the water for hours at a time. They mate and oviposit in company, and it is only at such times that the female may be taken.

528. *Hydrobasileus croceus* (Brauer). (Fig. 117.)

Tramea croceus Brauer, Verh. zool.-bot. Ges. Wien, vol. xvii, p. 813 (1867); id., ibid. vol. xviii, p. 714 (1868); Selys, Mitt. Mus. Dresden, p. 293 (1878); Kirby, Cat. Odon. p. 3 (1890); Selys, Ann. Mus. Civ. Genova, vol. xxx, p. 440 (1891).

Tramea extranea Hagen, Stett. Ent. Zeit. vol. xxviii, p. 228 (1867); Kirby, Cat. Odon. p. 177 (1890).

Hydrobasileus croceus Karsch, Berlin Ent. Zeit. vol. xxxiii, p. 351 (1890); id., Ent. Nachr. vol. xvii, p. 45 (1891); Kruger, Stett. Ent. Zeit. vol. lxiii, p. 80 (1902); Ris, Cat. Coll. Selys, fasc. xvi, pp. 966, 969, 970 (1913); Fraser, J. Nat. Hist. Soc. Siam, vol. iii, p. 459 (1919); id., J. Bombay Nat. Hist. Soc. vol. xxvii, p. 56 (1920); id., Rec. Ind. Mus. vol. xxvi, pp. 426, 444, 445 (1924); Laidlaw, Spolia Zeylanica, vol. xii, p. 350 (1924); id., J. F.M.S. Mus. vol. xvi, pp. 230, 240 (1930); Fraser, Rec. Ind. Mus. vol. xxxiii, p. 446 (1931); Lieftinck, Treubia, vol. xiv, pp. 425, 426 (1934).

Hydrobasileus extraneus Kirby, J. Linn. Soc., Zool. vol. xxiv, p. 547, pl. xli, fig. 1 (1893); Laidlaw, Proc. Zool. Soc. Lond. part 1, p. 65 (1902); Kruger, Stett. Ent. Zeit. vol. lxiii, p. 81 (1902); Martin, Mission Pavie, Zool. p. 4 (sep.) (1904).

Male.—Abdomen 29–33 mm. Hind-wing 40–42 mm.

Head : labium pale yellow ; labrum bright golden-ochreous ; antclypeus, sides of postclypeus and vesicle olivaceous ; middle of postclypeus, frons, and occiput bright ochreous ; eyes reddish-brown above, olivaceous to yellowish laterally and below. *Prothorax* olivaceous with a golden tinge, a narrow black transverse band separating middle and anterior lobes ; *thorax* rich olivaceous suffused with golden reddish-brown. *Legs* ochreous. *Wings* palely tinted throughout with burnt-brown or golden-amber, apices suffused with burnt-brown ; base of hind-wing along posterior border marked with a moderately broad dark reddish-brown fascia which, starting from tornal angle, extends into distal angle of anal loop and is limited distally by outer border of that loop ; anterior border of this marking sinuous and neuration within it pale yellow ; pterostigma ferruginous above, bright ochreous beneath ;

membrane reddish-brown ; nodal index

$\frac{9-15\frac{1}{2}}{11-10}$	$\frac{16\frac{1}{2}}{10-12}$
---------------------------------	-------------------------------

other details of venation as for genus. *Abdomen* olivaceous, changing to reddish or ochreous towards anal end, marked with black as follows :—All transverse sutures, jugal sutures, mid-dorsal carina, and ventro-lateral borders very finely ; apical ends of segments 3 to 9 narrowly bright yellow ; segments 4 to 9 with apical and basal dorsal black wedge-shaped spots which gradually meet to enclose spots of the ground-colour on segments 5 to 7 and completely cover dorsum of 8 and 9 ; segment 10 black except for dorsal carina and a spot on each side which are yellowish. *Anal appendages* reddish-brown, of the usual Libelluline shape, but rather long and narrow, about as long as segment 9. *Genitalia* as for genus.

Female.—Abdomen 28–34 mm. Hind-wing 42–48 mm.

Exactly similar to male ; *abdomen* stouter, especially towards base. *Genitalia* as for genus.

Distribution.—INDIA, BURMA, and CEYLON ; extending through S. Asia to Borneo, Java, and Sumatra, and to Formosa and the Philippines. This species is very local and, apart from a few specimens which I have received from Siam, no collector has ever sent it to me. I found it very local but common in Coorg and parts of Malabar ; a few specimens were observed by myself at Khandala, Bombay Presidency. It breeds in all the small pulping tanks in the coffee totes in Coorg and in weedy tanks in Malabar. During September I noted many specimens soaring rather high along the railway line, Walayar Forest, Malabar, keeping company with *Epophthalmia frontalis*. Indian forms are much larger than those from elsewhere ; it is one of our largest and finest Libellulines and a magnificent insect when seen in flight.

The *type* is a male in the Selys collection, Brussels Museum ; specimens are found in most national collections.

Genus **TRAMEA** Hagen. (Fig. 118.)

Tramea Hagen, Syn. Neur. Amer. p. 114 (1861); id., Stett. Ent. Zeit. vol. xxviii, p. 222 (1867); Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, pp. 364, 713 (1868); Kirby, Trans. Zool. Soc. Lond. vol. xii, pp. 258, 268 (1889); Calvert, Proc. Calif. Acad. (2) vol. iv, p. 471 (1895); Kruger, Stett. Ent. Zeit. vol. lxiii, p. 81 (1902); Förster, Jber. Mannheim, vols. lxxi, lxxii, p. 4 (sep.) (1906); Calvert, Biol. C. Amer., Neur. pp. 203, 299 (1905-1906); id., Ann. Carnegie Mus. vol. vi, p. 258 (1909); Ris, Cat. Coll. Selys, fascs. ix, xvi, pp. 36, 970-973 (1909, 1913); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvii, pp. 51, 52 (1920).

Libelluline dragonflies of large size and robust build, rather similar to the last genus, variably coloured, with wings coloured and marked at the base. Head large; eyes moderately contiguous; frons broad, projecting, often with distinct crest, but variable in the species; vesicle high, variable. Prothorax

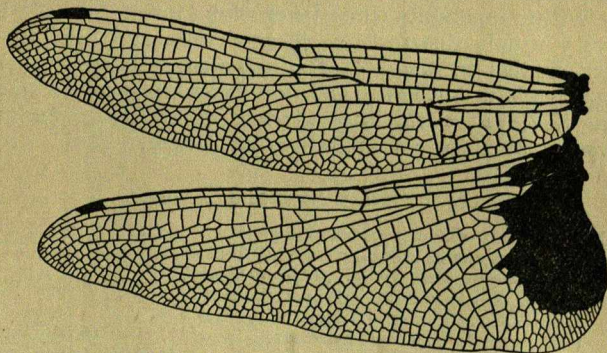


Fig. 118.—Wings of *Tramea virginia* (Rambur), male.

with small posterior lobe; thorax robust; legs very long and slim: hind femora with numerous closely-set small spines gradually lengthening distally. Wings long and very broad at base, rather pointed at apex, reticulation moderately close, especially at base of hind-wing, which is more or less broadly marked with a large or irregular opaque spot; discoidal cell of fore-wing very narrow, traversed once or twice, its costal side about one-third the length of basal or distal sides; that of hind-wing entire, its base at level of arc; sectors of arc with a long fusion at origin; arc situated between the first and second antenodal nervures; $10\frac{1}{2}$ or $11\frac{1}{2}$ antenodal nervures, distal one incomplete; 1 cubital nervure to all wings; *Cu*_{iii} arising from posterior angle of discoidal cell in hind-wing; discoidal field beginning with 4 rows of cells, its borders diverging very slightly at wing-border; no supplementary nervures to bridge; subtrigone in fore-wing merged in basal neuration of wing; 2 rows of cells between *IR*_{iii} and *Rs*_{pl}; anal loop dilated



at apex and somewhat quadrate, distal angle more obtuse than apical; pterostigma small, unequal in fore- and hind-wings, smaller in the hind; membrane moderately large. Abdomen rather long and slim, base somewhat dilated, then markedly constricted at segments 3 and 4 (less so in the female), and finally, narrowly fusiform to the end; anal appendages very long and slim in both sexes. Genitalia of male: lamina projecting hood-like, arched; hamules without distinct base, hooks very large and elongate, very prominent in profile; lobe long and narrow, but variable and often constricted and somewhat clubbed at apex. Female without dilatation of borders of segment 8; vulvar scale prolonged, deeply cleft into two triangular plates; ninth ventral plate prolonged as a tongue-like process overlapping segment 10.

Genotype, *Libellula carolina* Linné-Johansson.

Distribution.—Cosmopolitan. Circum-tropical and sub-tropical. Within our limits three species are known, two of which are very widely distributed. Their habits and habitats are closely similar to those of *Hydrobasileus*. They engage in migratory flight, but not to the same extent as seen in *Pantala*; during the flight of the latter a good proportion of specimens of *Tramea* are to be seen accompanying them.

Key to Indian Species of Tramea.

- | | | | |
|----|---|---|-----------------|
| 1. | { | Hamule but slightly overlapping lobe; two large black spots at base of hind-wing surrounded by a golden-yellow areola, one in cubital space, the other lying obliquely in anal area of wing, the two narrowly confluent near base of discoidal cell in the male | [Kirby, p. 432. |
| | | <i>basilaris burmeisteri</i> | |
| | { | Hamule much longer and greatly overlapping lobe; only a single black spot of variable size at base of hind-wing .. | 2. |
| 2. | { | Black spot in hind-wing confined to base, very narrow, not invading base of anal loop | [p. 436. |
| | | <i>limbata</i> (Desjardins), | |
| | { | Spot in hind-wing dark reddish-brown, very large, extending distally to distal end of discoidal cell and involving nearly whole of anal loop | [p. 435. |
| | | <i>virginia</i> (Rambur), | |

529. *Tramea basilaris burmeisteri* Kirby. (Fig. 119, b.)

Libellula chinensis Burmeister, Handb. Ent. vol. ii, p. 852 (1839); Calvert, Trans. Amer. Ent. Soc. vol. xxv, p. 70 (1898).

Libellula basilaris Hagen, Peters, Reise n. Mossambique, Zool. vol. v, p. 105 (1862).

Tramea burmeisteri Kirby, Trans. Zool. Soc. Lond. vol. xii, p. 316 (1889); id., Cat. Odon. p. 3 (1890); id., J. Linn. Soc., Zool. vol. xxiv, p. 548 (1895); MacLachlan, Nat. Hist. Socotra,

p. 398, pl. xxiv, fig 4 (1903); Martin, Mission Pavie, Zool. p. 4 (sep.) (1904); Ris, Cat. Coll. Selys, fasc. xvi, pp. 971, 975 (1913); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvii, pp. 52, 53 (1920); Laidlaw, Spolia Zeylanica, vol. xii, p. 350 (1924); Fraser, Rec. Ind. Mus. vol. xxvi, pp. 426, 445 (1924); id., ibid. vol. xxxiii, p. 446 (1931).

Male.—Abdomen 30–35 mm. Hind-wing 40–44 mm.

Head: labium bright yellow, middle lobe black; labrum reddish-brown, very broadly bordered with black; anteclypeus and sides of postclypeus olivaceous-yellow; postclypeus and frons bright vermilion-red with a fine basal black line to latter above; vesicle olivaceous or tipped with red; occiput olivaceous; eyes dark reddish-brown above, lilaceous laterally and beneath. *Prothorax* yellowish; *thorax* olivaceous, with a reddish tinge on dorsum and a bluish-green tinge

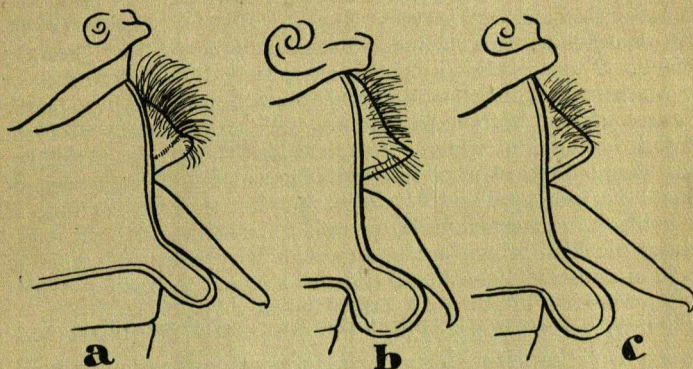


Fig. 119.—Male genitalia of (a) *Tramea limbata* (Desjardins); (b) *Tramea basilaris burmeisteri* Kirby; (c) *Tramea virginia* (Rambur).

laterally; postero-lateral suture narrowly black and confluent with a second black stripe which traverses the spiracle and is incomplete above. *Legs* black; coxæ, trochanters, and anterior pair of femora on inner side and at base olivaceous. *Wings* hyaline, hind-wing with a rather variable dark reddish-brown marking at base, usually limited to cubital space, base of discoidal cell and hypertrigone, extreme base of anal loop, and anal area adjoining cubital space; this marking narrowly confluent with a larger, broader, and curved stripe running from midrib of anal loop to tornal angle, but not quite reaching latter; venation in this dark area bright yellow, in some specimens the marking extending forwards into basal and subcostal spaces as far distal as second antenodal nervure. Membrane pure white; pterostigma bright ochreous, short,



that of hind-wing only two-thirds the length of that of fore-wing. *Abdomen* bright brick-red, marked with black as follows:—Black apical annules to segments 4 to 7 constricted and nearly interrupted on dorsum of segments and becoming broader from segment to segment; segment 8 black, with a variable triangular yellow basal spot on each side; segment 9 black with a small medial lateral spot on each side; segment 10 similar to last, apical joints of segments 7 to 9 bright yellow; beneath black ringed with yellow. *Anal appendages* very long, nearly as long as the last three segments of abdomen, narrow at base, sharply angulated subbasally like a bayonet, then narrowly cylindrical to apex, which is acuminate; beneath angulation near base many small ventral spines; dark reddish-brown to black. For *genitalia* see fig. 119, b.

Female.—Abdomen 32–36 mm. Hind-wing 38–45 mm.

Resembles the male very closely; face and frons bright chrome-yellow, not tinted with red, labrum less broadly black. *Thorax* decidedly bluish-green laterally, black markings more defined, humeral suture finely black but expanding above; lateral stripes both expanded in their upper parts to form definite elongate spots. *Wings* often tinted with yellow, this deepening in tint to nearly as far as level of pterostigma; basal marking similar to male except that the two portions of the black area are invariably well separated; in both sexes these blackish-brown spots surrounded by a broad areola of golden-amber. Venational details similar to male; nodal

index $\frac{9-12\frac{1}{2}}{10-7} \mid \frac{12\frac{1}{2}-8}{7-10}, \frac{9-11\frac{1}{2}}{12-7} \mid \frac{12\frac{1}{2}-10}{7-12}$. *Abdomen* olivaceous-

green or yellowish with similar black markings as in the male. *Anal appendages* black, of similar length to male, but without any angulation at middle and no ventral obtuse spine. *Genitalia* as for genus.

Distribution.—CEYLON, INDIA, and BURMA; extending into Malaysia but becoming increasingly rare as traced eastwards. A common insect throughout the plains and not infrequently seen up to altitudes of over 7,000 ft. in the Nilgiris; during the flying season in September and October they accompany *P. flavescens* in their annual migration. Its habits are very similar to those of *H. basileus*; its habitats are small weedy tanks or marshes; in the Deccan I have found it breeding in small deep tanks but a few feet in diameter. This subspecies is easily determined by the irregular duplicate shape of the basal marking to hind-wing.

Burmeister's *type* is in the Museum of Comparative Zoology, Mass.; Kirby's *type* of *T. burmeisteri* is in the British Museum.

530. *Tramea virginia* (Rambur). (Figs. 118 & 119, c.)

Libellula chinensis De Geer, Mem. Ins. vol. iii, p. 556, pl. xxvi, fig. 1 (1773); Hagen, Peters, Reise n. Mossambique, Zool. vol. v, p. 105 (1862).

Libellula virginia Rambur, Ins. Névrolog. p. 33 (1842).

Tramea chinensis Hagen, Syn. Neur. N. Amer, p. 144 (1861); Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, p. 713 (1868); Hagen, Proc. Boston Soc. vol. xviii, p. 65 (1875); Selys, C. R. Soc. Ent. Belg. (7. vii. 1888); Kirby, Cat. Odon. p. 3 (1890); Martin, Mission Pavie, Zool. p. 4 (sep.) (1904).

Tramea virginia Kirby, Cat. Odon. p. 3 (1890); Muttkowski, Bull. Publ. Milwaukee Mus. (1) vol. i, p. 181 (1910); Ris, Cat. Coll. Selys, fasc. xvi, pp. 972, 978, 979 (1913); Fraser, J. Bombay Nat. Hist. Soc. vol. xxx, p. 48 (1924).

Male.—Abdomen 34–37.5 mm. Hind-wing 43–49 mm.

Head: labium dark chrome-yellow, middle lobe and adjacent parts of lateral lobes black; labrum ochreous, broadly bordered with blackish-brown; face and frons olivaceous, the latter suffused with bright vermilion or rose-red and with a very broad black border at base above which has a metallic blue or violaceous reflex; vesicle black in front, olivaceous behind, tipped with two small red points; occiput dark olivaceous; eyes reddish-brown above, lilaceous below. *Prothorax* dark ochreous, with a black stripe between anterior and middle lobes; *thorax* dark olivaceous-green, with small obscure dark points at upper ends of humeral and postero-lateral sutures and another over spiracle. *Legs* black or dark reddish-brown. *Wings* hyaline, with reddish reticulation at basal half, tinted with amber-yellow and enfumed more or less, especially towards apices and along posterior border of wings; base of fore-wings tinted with golden-amber to as far as basal antenodal nervure and cubital nervure; base of hind-wing with a very broad, very dark burnt-brown or reddish-brown mark extending distally to one cell beyond outer angle of discoidal cell and from cubital space almost to posterior border and to midrib of anal loop posteriorly as its distal limit; neuration within this mark a very close bright red network of cells well defined against the dark background. Membrane blackish-brown, paler along free border; pterostigma dark ochreous, that of hind-wing slightly more than half the length

of that of fore-wing; nodal index $\frac{10-11\frac{1}{2}}{11-7} \bigg| \frac{10\frac{1}{2}-10}{7-10}$. *Abdomen*

bright brick-red, marked with black on last three segments; segment 8 with a large triangular reddish spot at baso-lateral ventral angle; segment 9 with a small spot on each side of the same colour; segment 10 entirely black. *Anal appendages* black, red at extreme base, similar to those of last species, but the apical portion even longer. *Genitalia*: hamule markedly longer than lobe (see fig. 119, c).

Female.—Abdomen 35 mm. Hind-wing 49 mm.

Differs only from the male in sexual characters and the basal marking on hind-wing, which has a large indentation on the basal side of wing nearly cutting it into two spots and approaching the condition seen in *T. basilaris burmeisteri*; the outer border of the marking is also serrate or sinuous and it falls more short of the posterior border of wing. *Anal appendages* nearly as long as in the male, black, straight, very narrow. Vulvar scales of great size, deeply cleft into two keeled angulate processes, rounded at apices and slightly overlapping apical end of ninth segment.

Distribution.—Only known from BURMA within our limits, but becoming common throughout Indo-China, China, and Formosa. I have a pair from Kalaw, N. Shan States, Burma, and several specimens from Siam. It is a much larger insect than *basilaris burmeisteri* or *limbata*, and is easily distinguished from both of these by the very large basal marking to hind-wing.

The *type* has been lost; Rambur's type of *virginia* is in the Selys collection in the Brussels Museum. There are eight specimens from Indo-China in the British Museum.

531. *Tramea limbata* (Desjardins). (Fig. 119, a.)

- Libellula limbata* Desjardins, Rapport Soc. Maurice, 1 (1832); id., Ann. Soc. Ent. France Bull. vol. iv, p. iii (1835); Selys, Maillard, Réunion 11, k. p. 34 (1862); id., Pollen & Van Dam, Madagas., Ins. p. 22 (1869).
Libellula incerta Rambur, Ins. Névro. p. 34 (1842).
Libellula mauriciana Rambur, Ins. Névro. p. 34 (1842); Smith, Fred., Zool. Rodriguez, p. 6 (year ?).
Libellula stylata Rambur, Ins. Névro. p. 37 (1842).
Libellula similata Rambur, Ins. Névro. p. 36 (1842).
Tramea rosenbergi Brauer, Verh. zool.-bot. Ges. Wien, vol. xvi, p. 564 (1866); id., ibid. vol. xvii, p. 288 (1867); id., ibid. vol. xviii, p. 714 (1868); Selys, Mitt. Mus. Dresden, p. 293 (1878); Kirby, Cat. Odon. p. 3 (1890); id., Ann. Mag. Nat. Hist. (6) vol. xiv, p. 15 (1894); Ris, Archiv für Nat. vol. i, p. 176 (1900).
Tramea transmarina Brauer, Verh. zool.-bot. Ges. Wien, vol. xvii, pp. 21, 505 (1867); id., ibid. vol. xviii, p. 714 (1868); Kirby, Cat. Odon. p. 3 (1890).
Tramea samoensis Brauer, Verh. zool.-bot. Ges. Wien, vol. xvii, pp. 22, 505 (1867); id., ibid. vol. xviii, p. 714 (1868); Kirby, Cat. Odon. p. 3 (1890).
Tramea mauriciana Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, p. 714 (1868).
Tramea similata Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, p. 714 (1868); Kirby, Cat. Odon. p. 3 (1890).
Tramea stylata Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, p. 714 (1868); Selys, Mitt. Mus. Dresden, p. 293 (1878); Kirby, Cat. Odon. p. 3 (1890); Cabot, Mem. Mus. Comp. Zool. vol. xvii, p. 48 (1890) (larva); Kirby, J. Linn. Soc., Zool. vol. xxiv, p. 548 (1893).



- Tramea eurybia* Selys, Mitt. Mus. Dresden, pp. 293, 298 (1878); Kirby, Cat. Odon. p. 3 (1890).
- Tramea euryale* Selys, Mitt. Mus. Dresden, pp. 293, 298 (1878); Albarda, Veths. Midd. Sumatra, Neur. p. 3 (1881); Selys, Ann. Mus. Civ. Genova, vol. xxvii, p. 450 (1889); Kirby, Cat. Odon. p. 3 (1890); Kruger, Stett. Ent. Zeit. vol. lxiii, p. 86 (1902); Needham, Proc. U.S. Nat. Mus. vol. xxvii, p. 712, pl. xl, fig. 4 (1904).
- Tramea continentalis* Selys, Mitt. Mus. Dresden, p. 299 (1878); Kirby, Cat. Odon. p. 3 (1890); Martin, Mem. Soc. Zool. France, vol. ix, p. 102 (1896); Calvert, Proc. Acad. Phil. p. 141 (1898); Martin, Ann. Mus. Civ. Genova, vol. xliii, p. 655 (1908).
- Tramea limbata* Kirby, Trans. Zool. Soc. Lond. vol. xii, p. 318 (1889); id., Cat. Odon. p. 3 (1890); Calvert, Proc. U.S. Nat. Mus. vol. xviii, p. 121, figs. 1, 2 (1895); Ris, Tijdschr. v. Ent. vol. lv, p. 165 (1912); id., Cat. Coll. Selys, fasc. xvi, pp. 972, 979-988, 1222, 1223 (1913); Fraser, Rec. Ind. Mus. vol. xxvi, pp. 426, 445 (1924); Laidlaw, Spolia Zeylanica, vol. xii, p. 350 (1924); id., J. F.M.S. Mus. vol. xvi, pp. 230, 241 (1930); Fraser, Rec. Ind. Mus. vol. xxxiii, p. 446 (1931).
- Tramea translucida* Kirby, Trans. Zool. Soc. Lond. vol. xii, p. 315 (1889); id., Cat. Odon. p. 3 (1890).
- Tramea madagascariensis* Kirby, Trans. Zool. Soc. Lond. vol. xii, pp. 317, 318 (1889); id., Cat. Odon. p. 4 (1890).
- Tramea limbata continentalis* Ris, Jenaische Denks. vol. xiii, p. 344 (1908).
- Tramea limbata* race *similata* Fraser, J. Bombay Nat. Hist. Soc. vol. xxvii, pp. 53, 54 (1920).

Male.—Abdomen 33-35.5 mm. Hind-wing 44-46 mm.

Head: labium dirty yellow, middle lobe occasionally blackish-brown; labrum black or bright reddish-ochreous with middle portion black; anteclypeus olivaceous; postclypeus, lower border and sides of frons olivaceous or bright ochreous; upper surface of frons and upper part of anterior surface dark metallic violet; vesicle and occiput dark olivaceous; eyes dark brown above, olivaceous laterally and below. *Prothorax* dark brown; *thorax* olivaceous with a reddish suffusion, especially on dorsum, some obscure dark lines on humeral and postero-lateral sutures and over spiracle, these expanding above except the latter, which is incomplete above. *Legs* black, coxæ and trochanters reddish-brown. *Wings* hyaline, reticulation red towards base of wings, occasionally evenly and palely enfumed; base of hind-wing with an extremely variable blackish-brown marking in which the nervures are reddish; Peninsular India, Ceylon, and Deccan forms have this marking extending from base to first antenodal nervure, distal end of cubital space, and from thence straight back towards posterior border of wing, near which it curves basalwards to reach tornal angle. Assam forms have the marking much narrower, absent in the costal and subcostal spaces, and not extending distal to the cubital nervure. (The former conforms to the type of Rambur's *similata* and the



latter to Selys's type of *euryale*.) Unlike *T. basilaris burmeisteri* and *T. virginia*, this marking is not surrounded by an areola of golden-amber. Pterostigma dark ochreous, similar to the two former species; membrane black; nodal index $10-11\frac{1}{2} \mid 11\frac{1}{2}-11$
 $13-7 \mid 7-13$. Abdomen blood-red, marked with black as in the last species. Anal appendages also similar to the last species, of great length and very narrow. For genitalia see fig. 119, a; hamule overlapping lobe, but not to the same extent as in *T. virginia*.

Female.—Abdomen 32 mm. Hind-wing 43–46 mm.

Exactly similar to male save for sexual characters. Black markings of abdomen often more extensive; narrow black apical annules to segments 4 to 7 and ventral borders of same finely black. Anal appendages and vulvar scale as for last species.

Distribution.—Typical Indian forms, such as those found in Ceylon and Southern India, conform to type *similata*, but as many forms occur within Indian limits, and as it is probable that a complete series grading into one another could be made from these, I have grouped them all under the name *limbata*. *T. limbata* is widely distributed and varies considerably, as is evident from the large number of names it has received, often from the same author. It extends from Africa and Madagascar, across S. Asia and the Sundaic Archipelago, to Oceania and Australia. The very dark, sharply-defined basal marking in hind-wing, not surrounded by a golden-yellow areola, will serve to distinguish it from the other two Indian species of *Tramea*.

The type is in the Selys collection, Brussels Museum, as is also Rambur's type of *similata*; other types are in this same collection and in the Hamburg and British Museum collections.

Genus **PSEUDOTRAMEA** Fraser. (Fig. 120.)

Pseudotramea Fraser, J. Bombay Nat. Hist. Soc. vol. xxvii, p. 149 (1920).

Libelluline dragonflies of similar size and appearance to *Tramea*, but with duller colouring and wings immaculate. Head large; eyes broadly contiguous; frons broad, rounded, without distinct crest, sulcus broad and shallow; vesicle high, flattened at summit. Prothorax with small posterior lobe; thorax robust; legs moderately long and slim; hind femora with rows of numerous short but robust, gradually lengthening spines. Wings long, broad at base, rather pointed at apex, reticulation rather close; discoidal cell

in fore-wing traversed, very narrow, costal side about one-third the length of basal and distal sides; that of hind-wing entire, its base at level of arc; sectors of arc widely fused; arc situated between the first and second antenodal nervures; $11\frac{1}{2}$ antenodal nervures, distal one incomplete; 1 cubital nervure in all wings; *Cuii* arising from posterior angle of discoidal cell in hind-wing; discoidal field beginning with 3 or 4 rows of cells and continued as rows of 4, its borders parallel to wing-border; no supplementary nervures to bridge; subtriangle in fore-wing lost in basal venation; 3 rows of cells between *IRiii* and *Rspl*; anal loop very long, slim, but slightly dilated distally; pterostigma very short, that of hind-wing but slightly more than half the length of that of fore-wing; membrane moderately large. Abdomen relatively short, slim, slightly dilated at base, slightly contracted at segments 3 and 4, then slightly fusiform

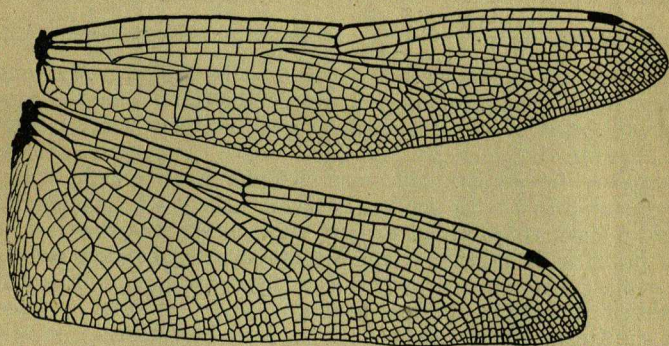


Fig. 120.—Wings of *Pseudotrimea prateri* Fraser, male.

to the end. Anal appendages very long and slim as in *Trimea*. Genitalia: hamule only very slightly longer than lobe, as in *T. basilaris burmeisteri*; that of female unknown.

Genotype, *Pseudotrimea prateri* Fraser.

Distribution.—BENGAL and SIKKIM only. A monotypic genus closely allied to *Trimea*, from which it differs by the immaculate wings, by the 3 rows of cells between *IRiii* and *Rspl*, and by the jugal suture being present on segments 2 and 3 only, absent on segment 4.

532. *Pseudotrimea prateri* Fraser. (Fig. 120.)

Pseudotrimea prateri Fraser, J. Bombay Nat. Hist. Soc. vol. xxvii, p. 149 (1920).

Male.—Abdomen 36 mm. Hind-wing 46 mm.

Head: labium ochreous, middle lobe dark reddish-brown; labrum dark ochreous with anterior border of mid-lobe of this narrowly black; anteclypeus olivaceous; postclypeus and sides of frons bright golden-yellow, frons similar, but with a reddish suffusion and dark brown at base above; vesicle olivaceous, bright ochreous at apex; occiput dark brown; eyes dark reddish-brown above, olivaceous laterally and below. *Prothorax* dark brown; *thorax* golden-brown on dorsum, olivaceous laterally, with shades of ochreous above and obscurely marked with three narrow black lines on humeral and postero-lateral sutures and over spiracle, all dilated in their upper part except the latter, which is incomplete above. *Legs* black; coxæ, trochanters, and bases of femora dark reddish-brown. *Wings* hyaline, unmarked except for a very short ray in the cubital space of hind-wing which extends to cubital nervure and posteriorly into 2 cells of anal field; membrane pure white; pterostigma ochreous between black nervures; nodal index $\frac{11-11\frac{1}{2}}{13-7} \mid \frac{11\frac{1}{2}-12}{7-13}$; 3 rows of cells between *IRiii* and *Rspl* in all wings; 3 rows of cells between *MA* and *Mspl* in fore-wing, but only 2 rows in the hind-wing; a long nervure, with its concavity facing costal border of wing, present in all wings between *Rii* and *Riii* (= *IRii*); other venational details as for genus. *Abdomen* rust-red marked with black; segments 3 to 7 with ventral borders finely black and narrow apical black rings which expand subdorsally; segments 8 to 10 black with a large triangular basal spot on each side of 8 and a small central spot on each side of segments 9 and 10 reddish-ochreous. *Anal appendages* black, reddish at base, of similar shape to those of *T. basilaris burmeisteri*, coarsely spined below near base. *Genitalia* as for genus.

Female unknown.

Distribution.—The type is a male from the DARJEELING DISTRICT; there is another male in the Darjeeling Museum, and a third in my own collection from Mungpoo, Darjeeling District, on the borders of Sikkim. This species is easily distinguished by the presence of 3 rows of cells between *IRiii* and *Rspl* in all wings, and between *MA* and *Mspl* in the fore-wing; the absence of the basal marking, except for a very inconspicuous spot in the cubital space, will serve to separate it from any species of *Tramea*. Nothing is known of its habits, but they are probably similar to those of *Tramea*.

The type is in the British Museum.

Genus **UROTHEMIS** Brauer. (Fig. 121.)

Urothemis Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, pp. 175, 366, 737 (1868); Kirby, Trans. Zool. Soc. Lond. vol. xii, pp. 262, 282 (1889); Karsch, Berlin Ent. Zeit. vol. xxxiii, p. 356 (1890); Selys, Ann. Soc. Ent. Belg. vol. xli, p. 75 (1897); Förster, Jber. Mannheim, vols. lxxi, lxxii, p. 14 (sep.) (1906); Ris, Janaische Denks. vol. xiii, p. 344 (1908); id., Cat. Coll. Selys, fascs. ix, xvi, pp. 37, 1016, 1017 (1909, 1913); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvii, pp. 262, 263 (1920).

Libelluline dragonflies of moderately large size and robust build, coloured ochreous, reddish or black, and with wings partly coloured at the base. Head large; eyes broadly contiguous; frons rounded at crest and cut into two conical eminences by a very deep sulcus; vesicle high, broad, anterior face straight, rounded above. Prothorax with small posterior

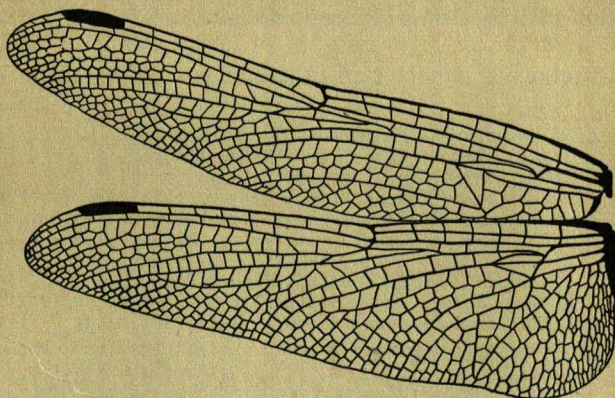


Fig. 121.—Wings of *Urothemis signata signata* (Rambur), male.

lobe; thorax robust; legs long and slim: hind femora with rows of small, gradually lengthening, closely-set spines. Abdomen slightly dilated dorso-ventrally at base, then gradually tapered to the end, relatively short, strongly carinated. Anal appendages of the usual Libelluline shape, shorter than in the last genera; genitalia: lamina arched, hood-shaped, rather depressed; hamules without dilated base, hooks long, straight, and projecting markedly; lobe ungulate, narrow and elongate, rounded at apex. Female without dilatation of borders of segment 8; vulvar scales of great length, projecting strongly ventralwards and deeply cleft at apex into two spatulate lobes which overlap ninth and base of tenth segments; ninth ventral plate prolonged into a tongue-like process which completely overlaps segment 10. Wings long and moderately broad, reticulation rather open; discoidal



cell in fore-wing moderately broad, costal side more than half as long as basal and about half the length of distal side, entire ; that of hind-wing entire, its base at level of arc ; sectors of arc separated at origin ; arc situated between the first and second antenodal nervures ; 7 antenodal nervures, distal one complete ; *Cu*i arising from posterior angle of discoidal cell in hind-wing ; 1 cubital nervure in all wings ; discoidal field beginning with 2 rows of cells and continued as such nearly to wing-border, its sides more or less parallel or slightly convergent at wing-border ; no supplementary nervures to bridge ; subtrigone in fore-wing 3-celled ; only 1 row of cells between *IR*iii and *Rs*pl ; anal loop relatively short, dilated at distal end, distal border strongly angulated ; pterostigma moderately long, equal in the fore- and hind-wings ; membrane large.

Genotype, *Urothemis bisignata* Brauer.

533. *Urothemis signata signata* (Rambur). (Figs. 121 & 122, c, d.)

Libellula sanguinea Burmeister, Handb. Ent. vol. ii, p. 858 (1839) ; Hagen, Verh. zool.-bot. Ges. Wien, vol. viii, p. 480 (1858) ; Calvert, Trans. Amer. Ent. Soc. vol. xxv, p. 87 (1898).

Libellula signata Rambur, Ins. Névropt. p. 117 (1842).

Urothemis sanguinea Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, p. 737 (1868) ; Kirby, Cat. Odon. p. 23 (1890) ; id., J. Linn. Soc., Zool. vol. xxiv, p. 552 (1893) ; Selys, Ann. Soc. Ent. Belg. vol. xli, p. 75 (1897) ; Martin, Mission Pavie, p. 5 (sep.) (1904) ; Förster, Jber. Nassau, vol. lix, p. 316, pl. A, fig. 1 (1906) ; Ris, Jenaische Denks. vol. xiii, p. 344 (1908).

Urothemis signata signata Ris, Cat. Coll. Selys, fasc. xvi, pp. 1023, 1024 (1913) ; Fraser, J. Bombay Nat. Hist. Soc. vol. xxvii, pp. 263, 264 (1920) ; id., Rec. Ind. Mus. vol. xxvi, pp. 426, 445 (1924) ; Laidlaw, Spolia Zeylanica, vol. xii, p. 351 (1924) ; Fraser, J. Siam. Soc., Nat. Hist. Suppl. vol. vii, p. 86 (1927) ; id., Rec. Ind. Mus. vol. xxxiii, p. 446 (1931).

Male.—Abdomen 27–28 mm. Hind-wing 34–37 mm.

Head : labium, labrum, and postclypeus ochreous ; anteclypeus and sides of postclypeus and frons olivaceous ; frons in front and above blood-red ; eyes blood-red above, reddish-brown laterally, lilaceous beneath ; occiput reddish-brown (occasionally a narrow black line at base of frons above). *Prothorax* dark reddish-brown ; *thorax* red on dorsum, olivaceous with a reddish suffusion laterally, and with an obscure small black point at upper ends of humeral and postero-lateral sutures. *Legs* dark reddish-brown to dull ochreous. *Wings* hyaline, with crimson reticulation ; extreme base of fore-wing golden-amber ; a broader dark amber-coloured spot at base of hind-wing extending variably distalwards to slightly beyond cubital nervure or to as far as base of discoidal cell, first antenodal nervure, and posteriorly in a curve to the

tornal angle; in this spot, and framed by it, a blackish-brown spot extending from cubital space posteriorly for a variable distance, the network of neurination over it bright ochreous or crimson; in most specimens a short, similarly-coloured ray in the costal and subcostal spaces; pterostigma ochreous above, pale whitish-yellow below; membrane blackish-brown. Nodal index $\frac{7-7}{7-5} | \frac{7-7}{5-7}$, usually very constant.

Abdomen blood-red, with some black marking on dorsum of segments 8 and 9. *Anal appendages* pale reddish, of the usual Libelluline shape. *Genitalia* as shown in fig. 122, d.

Female.—Abdomen 25–27 mm. Hind-wing 34–36 mm.

Closely similar to the male; differs as follows:—Labrum bright golden-yellow; face, frons, and vesicle bright lemon-yellow; occiput ochreous; eyes brown above. *Thorax* olivaceous-green laterally, ochreous or golden-brown on dorsum. *Wings* often with apices tipped narrowly with brown; basal

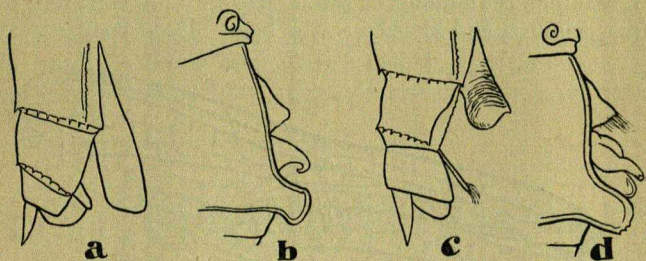


Fig. 122.—Genitalia of (a) *Aethriamanta brevipennis brevipennis* (Rambur), female; (b) the same of male; (c) *Urothemis signata signata* (Rambur), female; (d) the same of male.

marking variable, but usually the blackish-brown spot in anal area well separated from that in the cubital space, so that there are three distinct dark areas instead of two at base of hind-wing. *Abdomen* greenish-olivaceous, sometimes reddened on dorsum as in the male; black marks on dorsum of segments 8 and 9 as in the male, but these repeated on segments 3 to 7 as small subdorsal apical spots. *Anal appendages* reddish-brown or brown tipped with black, shortly conical; vulvar scale as for genus.

Distribution.—Throughout PENINSULAR INDIA, CEYLON, and BURMA except in desert tracts, and extending into Malaysia and Indo-China. I possess specimens from Coorg and S. Malabar, in both of which places it was very common, flying over small weedy tanks. I have also taken it in Bombay at Parel Tank; in Madras over the Coomb River, which is a very stagnant stream; in Bangalore on the Hebbal Tank;

and at Poona on the Katraj Lake. It appears to be common along the course of the Brahmaputra, and is one of the commoner insects of Siam. The open character of the venation, the stable, low nodal index, and the character of the basal marking in the hind-wing will serve to identify this species.

Rambur's type of *signata* is in the Selys collection, Brussels Museum.

Genus **ÆTHRIAMANTA** Kirby. (Fig. 123.)

Æthriamanta Kirby, Trans. Zool. Soc. Lond. vol. xii, pp. 262, 283 (1889); Karsch, Berlin Ent. Zeit. vol. xxxiii, p. 576 (1890); Kirby, Cat. Odon. pp. 24, 179 (1890); Selys, Ann. Soc. Ent. Belg. vol. xli, p. 81 (1897); Förster, Jber. Mannheim, vols. lxxi, lxxii, p. 13 (sep.) (1906); Ris, Cat. Coll. Selys, fasc. ix, xvi, pp. 37, 1027 (1909, 1913); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvii, pp. 260, 261 (1920).

Æthriamantha Ris, Cat. Coll. Selys, fasc. xvi, p. 1026 (1913) (*lapsus calami*).

Libelluline dragonflies of small size, variably coloured, with wings coloured and marked at the base. Head comparatively

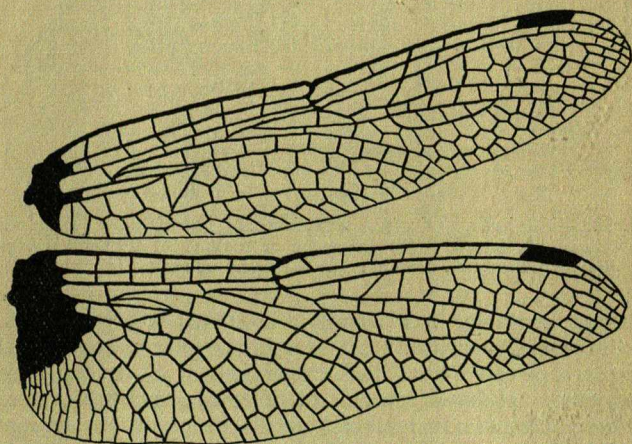


Fig. 123.—Wings of *Æthriamanta brevipennis brevipennis* (Rambur), male.

large; eyes broadly contiguous; frons rounded, without distinct crest, sulcus deep; vesicle broadly rounded. Prothorax with very small posterior lobe; thorax rather narrow, small; legs moderately long and robust; hind femora with a row of rather widely-spaced, very small spines of almost even size. Abdomen short and depressed, broadly fusiform in the male, nearly cylindrical in the female. Anal appendages of the

usual Libelluline shape. Genitalia of male : lamina broadly arched, hood-shaped ; hamules without distinct basal portion, hook variable, short and curled or long and straight ; lobe also variable, narrow and curving forwards, or short with expanded end. Female : vulvar scale rather similar to that of *Urothemis* but variable in length, extending on to base of segment 9 or nearly to end of abdomen and deeply cleft at apex. Wings short, moderately and comparatively broad ; reticulation open ; discoidal cell in fore-wing broad, costal side only slightly shorter than basal and more than half the length of distal, entire ; that of hind entire, and with base at level of arc ; sectors of arc separated in fore-wing, fused at origin for a very short distance in the hind-wing ; arc situated between the first and second antenodal nervures ; only 6 antenodal nervures, distal one complete ; 1 cubital nervure in all wings ; *Cu*i arising from posterior angle of discoidal cell in hind-wing ; discoidal field beginning with 2 rows of cells and continued as such nearly to wing-border, where its borders are but slightly divergent ; no supplementary nervures to bridge ; subtrigone in fore-wing a single cell ; only 1 row of cells between *IR*iii and *Rs*pl, the latter very short ; anal loop rather short and stout, distal angle well developed ; pterostigma small, membrane rather large.

Genotype, *Libellula brevipennis* Rambur.

534. *Æthriamanta brevipennis brevipennis* (Rambur). (Figs. 122, a, b, & 123.)

Libellula brevipennis Rambur, Ins. Névrof. p. 114 (1842).

Diplacina brevipennis Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, p. 733 (1868).

Æthriamanta brevipennis Kirby, Trans. Zool. Soc. Lond. vol. xii, p. 283, pl. liii, fig. 3 (1889) ; id., Cat. Odon. p. 24 (1890) ; Selys, Ann. Soc. Ent. Belg. vol. xli, p. 82 (1897) ; Ris, Jenaische Denks. vol. xiii, p. 346 (1908).

Urothemis brevipennis Selys, Ann. Mus. Civ. Genova, vol. xxx, p. 468 (1891).

Æthriamanta brevipennis brevipennis Ris, Cat. Coll. Selys, fasc. xvi, pp. 1029, 1030 (1913) ; Fraser, J. Bombay Nat. Hist. Soc. vol. xxvii, pp. 261, 262 (1920) ; id., Rec. Ind. Mus. vol. xxvi, p. p 426, 445, 446 (1924) ; Laidlaw, J. F.M.S. Mus. vol. xvi, p. 230 (1930) ; Fraser, Rec. Ind. Mus. vol. xxxiii, p. 446 (1931).

Male.—Abdomen 17–20 mm. Hind-wing 23–26 mm.

Head : labium bright yellow, clouded anteriorly with brown, middle lobe and borders of lateral very broadly black ; labrum black ; anteclypeus and lower border of frons palest olivaceous-brown ; postclypeus and frons blackish-brown, paling laterally, deepening to steely black on upper surface of frons ; vesicle blackish-brown ; face, frons and vesicle, and labrum heavily coated with short stiff black hairs ; eyes dark reddish-brown

above, paling laterally and beneath; occiput reddish-brown. *Prothorax* black; *thorax* dark chocolate-brown on dorsum, intensifying to black on humeral region and paling on sides to golden olivaceous-brown, especially on metepimeron, which may be olivaceous-green. *Legs* black, distal ends of hind femora on extensor surface with a spot of sharply-defined bright blood-red. *Wings* hyaline, tinted with deep golden-amber at base: in fore-wing to slightly beyond the first antenodal nervure and cubital nervure, but deficient in median space; in hind-wing in a broad fascia extending from costa to posterior border of wing and distally to beyond first antenodal nervure to as far as arc and end of cubital space; dark black opaque rays in costal, subcostal, and cubital spaces, and a large spot in anal area extending into base of anal loop and nearly to tornus, the nervures therein enclosed bright yellow. Pterostigma blackish-brown; membrane dark

reddish-brown; nodal index $\begin{array}{c|c} 5-6 & 6-5 \\ \hline 5-5 & 5-5 \end{array}$. *Abdomen* brilliant vermilion-red throughout, in strong contrast to the blackish thorax. *Anal appendages* also red and of conventional shape. *Genitalia*: hamules short, conical, hook short and markedly curled at apex; lobe short, expanded at apex.

Female.—Abdomen 16 mm. Hind-wing 23 mm.

Differs from the male in the following respects:—Labium with middle lobe yellow and borders of lateral lobes less heavily bordered with black; labrum glossy black, with a narrow elongate basal canary-yellow spot; whole of face and frons bright citron-yellow; vesicle yellow, dark brown on dorsum and middle. *Thorax* golden-olivaceous on dorsum, paler laterally, and with mid-dorsal carina, antealar sinus, humeral and postero-lateral sutures mapped out sharply in black. *Wings* similar to male, but the opaque black basal spot usually smaller and the pterostigma greyish-white beneath between thick black nervures. *Legs* black and with the femoral red spot replaced by an equally sharply-defined citron-yellow one. *Abdomen* golden-olivaceous with all sutures mapped out in black and with dorsum of segments 5 to 10 broadly black, towards apical end of segments 5 and 6, and for whole length of segments 7 to 10. Segments 3 and 4 with a small apical vestigial black dorsal mark. *Anal appendages* shortly conical, black; vulvar scale as for genus, but much shorter than in other species and extending to about middle of segment 9; ninth ventral plate very long, spatulate, overlapping whole length of segment 10.

Distribution.—COORG, MALABAR, ASSAM, BENGAL, and UPPER BURMA. Selys also gives Ceylon, but I can find no record of the species from that island. The species must be very local and somewhat rare, as I have never received

any from collectors in any part of India, Ceylon or Burma, my own specimens having been collected by myself. The brilliant red, dilated, and depressed abdomen, together with the bright red spot at distal end of femora, will serve to distinguish this species from any other Libelluline. It breeds in small weedy tanks well protected from the wind by surrounding jungle. It is a shy, restless insect, only coming to rest at intervals on the tips of blades of grass or reeds and, usually keeping well out over water, is thus difficult to capture.

Type in the Paris Museum ; eight males and two females in the Selys collection, Brussels Museum, from Sylhet, Calcutta, and Bhamo. I have numerous specimens from Coorg and S. Malabar.

Genus **MACRODIPLAX** Brauer. (Fig. 124.)

Macrodiplax Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, pp. 366, 737 (1868) ; Kirby, Trans. Zool. Soc. Lond. vol. xii, pp. 261, 282 (1889) ; Karsch, Berlin Ent. Zeit. vol. xxxiii, p. 356 (1890) ; Kirby, Cat. Coll. p. 23 (1890) ; Selys, Ann. Soc. Ent. Belg. vol. xli, p. 72 (1897) ; Ris, Cat. Coll. Selys, fascs. ix, xvi, pp. 37, 1035, 1036, 1227 (1909, 1913) ; Fraser, J. Bombay Nat. Hist. Soc. vol. xxvii, pp. 265, 266 (1920).

Libelluline dragonflies of moderate size, coloured ochreous or ferruginous, with reddish abdomen and hyaline wings,

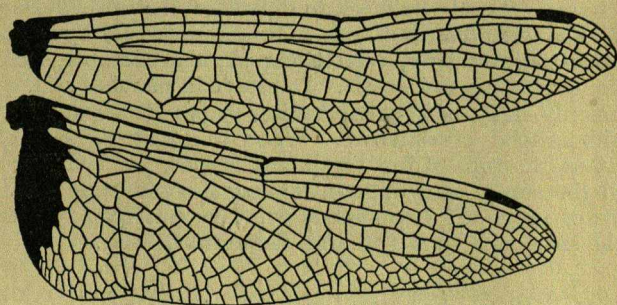


Fig. 124.—Wings of *Macrodiplax cora* (Brauer), male.

coloured and marked only at extreme base. Head large ; eyes broadly contiguous ; frons rounded, without sharply-defined crest, sulcus broad and deep ; vesicle very large, broad or surmounted by two obtuse points. Prothorax with very small posterior lobe ; thorax robust ; legs long and slim : hind femora with numerous very small, evenly-sized, rather widely-spaced spines sloping distalwards and with a longer one at distal end. Wings moderately long and broad, with very open reticulation ; discoidal cell in fore-wing



broad, antero-basal angle right-angled, costal side about two-thirds the length of basal and half that of distal side, entire; that of hind-wing entire, its base distinctly proximal to level of arc; sectors of arc separated in fore-wing, shortly fused in the hind; arc situated between the first and second antenodal nervures; 6 or 7 antenodal nervures, distal one complete; 1 cubital nervure in all wings; *Cu₁* arising in hind-wing from posterior angle of discoidal cell; discoidal field beginning with 2 rows of cells, its borders widely divergent at wing-border; no supplementary nervures to bridge; subtrigone in fore-wing 3-celled; 1 row of cells between *IR₁* and *Rs₁*, the latter very short and convex; anal loop dilated at apical end, its distal side strongly angulated; *M₁* very short and curved. Pterostigma short, that of hind-wing slightly shorter than that of fore-wing; membrane large. Abdomen rather broad, depressed, strongly carinated, relatively short, tapering from base to apical end. Genitalia: lamina depressed, with free border crenulate; hamules without distinct base, hook very short, curling inwards and backwards; lobe shortly and narrowly conical, longer than hamules.

Genotype, *Diplotax cora* Brauer.

Distribution.—Cosmopolitan; tropical and neotropical. The distribution, habits, and habitats of the single Indian species of this genus are a close parallel to those of *P. flavescens* and, like it, it is one of the most dominant of the world's dragonflies. The wide distribution is to be accounted for by its habit of migrating annually, this taking place in October, that is, at the same time as *Pantala*. It breeds in marshes and, quite commonly, may be found breeding in brackish water in the neighbourhood of estuaries. When in flight it rests overnight on the tops of low scrub and bushes, perched on twigs until the sun is well up, and making short, darting flights in chase of prey. If disturbed it will rise, but quickly returns to the same twig to fall an easy victim to the net.

535. **Macrodiplotax cora** (Brauer). (Fig. 124.)

Diplotax cora Brauer, Verh. zool.-bot. Ges. Wien, vol. xvii, pp. 20, 289 (1867).

Macrodiplotax cora Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, p. 737 (1868); Selys, Mitt. Mus. Dresden, p. 294 (1878); id., An. Soc. Españ. vol. xi, p. 15 (sep.) (1882); Kirby, Trans. Zool. Soc. Lond. vol. xii, p. 282 (1889); id., Cat. Odon, p. 23 (1890); Selys, Ann. Soc. Ent. Belg. vol. xli, p. 72 (1897); Ris, Tijdschr. v. Ent. vol. iv, p. 168 (1912); id., Cat. Coll. Selys, fasc. xvi, pp. 1036-1038 (1913); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvii, pp. 266, 267 (1920); id., Rec. Ind. Mus. vol. xxiv, p. 308 (1922); Laidlaw, Spolia Zeylanica, vol. xii, p. 351 (1924); Fraser, J. Siam. Soc., Nat. Hist. Suppl. vol. vii, p. 87 (1927); Laidlaw, J. F.M.S. Mus. vol. xvi, p. 231 (1930); Liefstinck, Treubia, vol. xiv, p. 429 (1934).

Male.—Abdomen 15–17 mm. Hind-wing 30–32 mm.

Head: labium creamy-white, middle lobe black; labrum black, narrowly yellow at base; anteclypeus olivaceous; postclypeus and frons bright ochreous suffused with red, which deepens on upper part of frons, sides of latter and face yellow, base of frons above black; vesicle red; occiput and upper part of eyes reddish-brown, lower part of latter lilaceous or pale yellow. *Prothorax* blackish-brown; *thorax* golden olivaceous-brown on dorsum, olivaceous- or bluish-green laterally, with obscure black spots on upper parts of humeral and postero-lateral sutures and a short lower stripe over spiracle. *Legs* black, coxæ, trochanters, and bases of femora yellow. *Wings* hyaline, with or without a narrow amber-yellow band at basal border of hind-wing, extending as far distal as cubital nervure and nearly to tornal angle of wing; pterostigma ferruginous to bright ochreous between thick black nervures; membrane

palest brown or white; nodal index $\frac{5-6}{5-5} \mid \frac{6-5}{5-5}$. *Abdomen*

bright ochreous tinted with blood-red on dorsum and with mid-dorsal black markings extending the whole length as follows:—Segment 1 with a triangular dorsal spot; segment 2 with a mid-dorsal stripe expanded at jugal suture and apical border of segment; segment 3 similar to 2; segments 4 to 7 with hour-glass-shaped mid-dorsal stripes; segments 8 and 9 with the stripes much broader but slightly constricted at base of segment 8; segment 10 with a small mid-dorsal point only. *Anal appendages* ochreous, of the usual Libelluline shape.

Female.—Abdomen 24–25 mm. Hind-wing 32 mm.

Closely similar to male, but paler in colour; face, frons, and vesicle creamy-white, base of frons glossy black above. *Prothorax* black. *Thorax* paler golden-olivaceous on dorsum and pale greenish-yellow laterally, with the black markings much more sharply defined. *Wings* entirely similar. *Abdomen* ochreous, not tinted on dorsum with red, black markings similar to male, but more extensive on segment 10. *Anal appendages* shortly conical, yellow. *Genitalia*: borders of segment 8 not dilated; vulvar scale short, only slightly overlapping segment 9, emarginate; ventral plate of segment 9 with two small spines, prolonged nearly to end of segment 10.

Distribution.—Widely distributed from the east coast of Africa to Oceania and Australia and throughout southern Asia. Lieftinck states that this species is found only on the coast, but this is not true in regard to its distribution in India. When the annual migration is on in September and October, great numbers may be met with throughout the Carnatic. I have seen every bush occupied on the Coimbatore Plateau, 1,480 ft., at a distance of fifty miles from the sea, and with the ramparts of the Western Ghats, rising to an average of 5,000 ft.,

intervening. It is common all down the east coast of India and Ceylon and apparently breeds in the estuaries of all the big rivers emerging thereon. It closely resembles *P. flavescens* in appearance, but is smaller, and has a conspicuous festooned, black, mid-dorsal pattern to the abdomen.

The *type* is in the Vienna Museum, and there is a cotype in the Selys collection, Brussels Museum. Examples of this common species are to be found in all national collections.

Genus **SELYSIOTHEMIS** Ris. (Fig. 125.)

Selysiothemis Ris, Cat. Coll. Selys, fascs. ix, xvi, pp. 37, 1040, 1041 (1909, 1913); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvii, pp. 267, 268 (1920).

Libelluline dragonflies of small size characterized by black body and colourless wings. Head relatively large; eyes

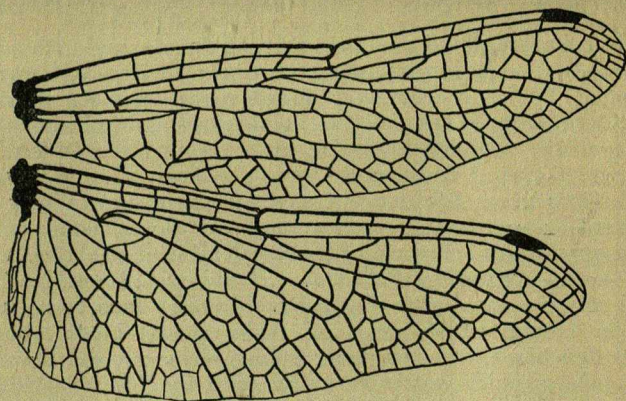


Fig. 125.—Wings of *Selysiothemis nigra* (Van der Linden), male.

broadly contiguous; frons flattened in front, without definite crest, sulcus deep; vesicle large, rounded. Prothorax with small posterior lobe; thorax small; legs long and moderately slim; hind femora with numerous rather closely-set small spines; abdomen rather short, dilated at base, slightly constricted at segment 3, then slim and cylindrical to end. Wings broad, rather short, reticulation very open; discoidal cell in fore-wing rather broad, costal side slightly more than half the length of basal and about half that of distal side, entire; that of hind-wing entire, its base at level of arc or slightly proximal thereto; sectors of arc separated in fore-wing, shortly fused in the hind; arc situated between the first and second antenodal nervures; 5 or 6 antenodal nervures,



distal one complete; 1 cubital nervure in all wings; *Cui* arising in hind-wing from posterior angle of discoidal cell; discoidal field beginning with 2 rows of cells, its borders divergent at wing-border; no supplementary nervures to bridge; subtrigone in fore-wing single-celled; 1 row of cells between *IRiii* and *Rspl*, the latter very short; anal loop but slightly dilated at the end, distal side strongly angulated; pterostigma very small; membrane moderately large. Genitalia of male: lamina very depressed, broadly and shallowly arched; hamules without distinct basal portion, broadly triangular, apex produced into a short curled hook; lobe produced, narrow and truncate. Female: borders of segment 8 not dilated; vulvar scales very small, flatly arched at apex, inconspicuous.

Genotype, *Libellula nigra* Van der Linden.

Distribution.—Mediterranean coast, Asia Minor to Turkestan, Arabia, Persia, Mesopotamia, Persian Gulf, Afghanistan, Baluchistan, and SIND. A monotypic genus, found only in Sind and Kashmir within our limits.

536. *Selysiotthemis nigra* (Van der Linden). (Fig. 125.)

Libellula nigra Van der Linden, Monogr. p. 16 (1825); Selys, Mon. Lib. Europ. pp. 29, 55, 209 (1840); Hagen, Syn. Lib. Eur. p. 37 (1840); Rambur, Ins. Névropt. p. 118 (1842); Selys-Hagen, Rev. des Odon. d'Eur. p. 65 (1850).

Tirthemis nigra Brauer, Verh. zool.-bot. Ges. Wien, vol. xviii, p. 736 (1868); Bentivoglio, Atti Soc. Nat. Mus. (4) vol. ix, p. 86 (1907).

Urothemis nigra Selys, C. R. Soc. Ent. Belg. (4. v. 1878); id., Ann. Soc. Ent. Belg. vol. xxxi, p. 77 (1887); Kirby, Cat. Odon. p. 23 (1890).

Urothemis advena Selys, C. R. Soc. Ent. Belg. (4. v. 1878); id., Ann. Soc. Ent. Belg. vol. xxxi, p. 69 (1887); Kirby, Cat. Odon. p. 24 (1890).

Selysiotthemis nigra Ris, Ann. Soc. Ent. Belg. vol. xli, p. 48 (1897); Selys, ibid. vol. xli, p. 71 (1897); Navas, Broteria, vol. v, p. 178 (1905); Bartenev, Ann. Mus. Zool. Acad. St. Petersb. vol. xvi, p. 411 (1912); id., Mitt. Kaukas. Mus. vol. vii, p. 108 (1912); Morton, Ent. Month. Mag. (3) vol. v, pp. 194, 196 (1919); id., Ann. Mag. Nat. Hist. (9) vol. v, p. 303 (1920); id., Ent. Month. Mag. (3) vol. vi, p. 87 (1920); Fraser, J. Bombay Nat. Hist. Soc. vol. xxvii, pp. 268, 269 (1920); id., ibid. vol. xxx, p. 49 (1924).

Male.—Abdomen 21–23 mm. Hind-wing 25–29 mm.

Head: labium and labrum creamy-white; face and frons pure white or greyish; a broad black line at base of frons above; vesicle black; occiput yellow to greyish-olivaceous; eyes brown above, paler below. *Prothorax* black; *thorax* palest yellow, with black markings changing to uniform black in full adult age; a broadly interrupted fine black stripe on humeral region, an elongate spot over spiracle, and a narrow

black stripe on postero-lateral suture. *Legs* black, changing to brownish at base of femora. *Wings* hyaline, colourless, including neurulation; pterostigma colourless between thick black nervures (these nervures being the only noticeable part

of wings); membrane white; nodal index $\frac{5-7}{5-5} \frac{6-5}{5-5}$. *Abdomen*

pale yellow marked with black in subadults, entirely black in full adults; an irregular black mid-dorsal stripe expanding apically on segments 5 to 9 and, together with a subdorsal stripe, partially enclosing spots of the ground-colour on segments 5 and 6. *Anal appendages* pale brownish-yellow, of the usual Libelluline type. *Genitalia* as for genus.

Female.—Abdomen 11–20 mm. Hind-wing 22–26 mm.

Somewhat similar to the teneral male but a much smaller insect, and with abdomen subcylindrical and somewhat compressed, very short. Markings in full adults similar to subadult male, but those of abdomen more restricted and often quite absent; in subadults abdomen pale greenish-white laterally, suffused with pale ochreous on dorsum and with sutures mapped out in darker ochreous. *Legs* greenish-white, distal ends of hind femora outwardly and inner surfaces of tibiae and whole of tarsi blackish-brown. *Anal appendages* very shortly conical. *Genitalia* as for genus.

Distribution.—That of the genus. I have seen specimens from Karachi, SIND, and KASHMIR, these being the sole specimens so far taken within Indian limits. I took this species in great numbers in Mesopotamia and at several ports on the Persian Gulf, so that it has most probably spread along the Mekran coast to Sind. On two occasions I saw it come aboard vessels in the Persian Gulf in great numbers accompanied by *O. trinacria* and *L. tetraphylla*, so that it appears to have strong migratory tendencies. Its colourless wings, with white neurulation and pterostigma and strongly contrasted black body, will serve to identify it from other Libellulines. The female is strikingly smaller than the male and often altogether colourless. The habits of this species are similar to those of *S. scoticum*, which it resembles very closely on the wing and in its habits.

The *type* is a male in the Selys collection, Brussels Museum, defective, and repaired with the head and abdomen of a *Sympetrum*. Specimens of both sexes in the British Museum collection, Mr. Morton's, and the Author's.

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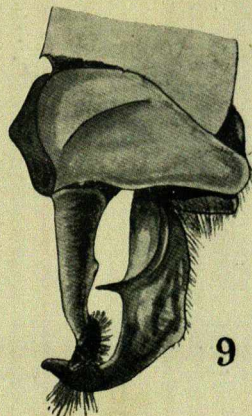
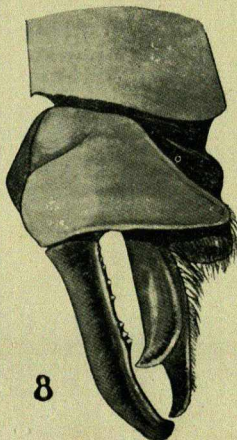
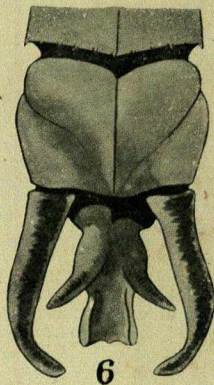
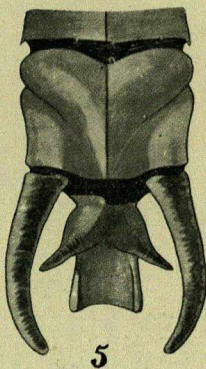
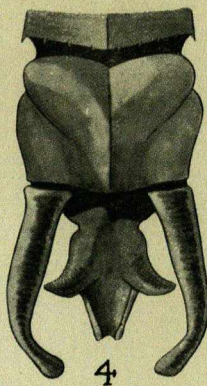
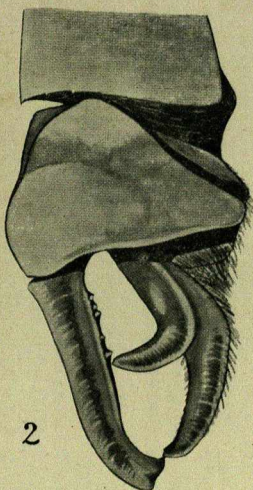
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EXPLANATION OF PLATE I.

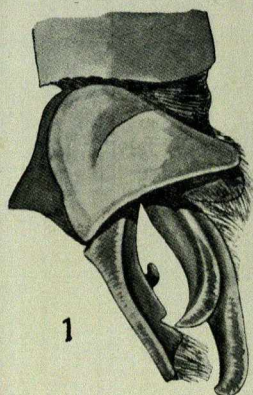
- Fig. 1. Anal appendages of *Idionyx minima* Fraser, ♂, right side.
2. The same of *Idionyx galeata* Fraser, ♂, right side.
 3. The same of *Idionyx travancorensis* Fraser, ♂, right side.
 4. The same of *Idionyx travancorensis* Fraser, ♂, dorsal view.
 5. The same of *Idionyx minima* Fraser, ♂, dorsal view.
 6. The same of *Idionyx saffronata* Fraser, ♂, dorsal view.
 7. The same of *Idionyx burliharensis* Fraser, ♂, right side.
 8. The same of *Idionyx saffronata* Fraser, ♂, right side.
 9. The same of *Idionyx unguiculata* Fraser, ♂, right side.



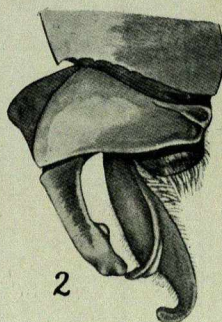
EXPLANATION OF PLATE II.

Fig. 1. Anal appendages of *Idionyx stevensi* Fraser, ♂, right side.

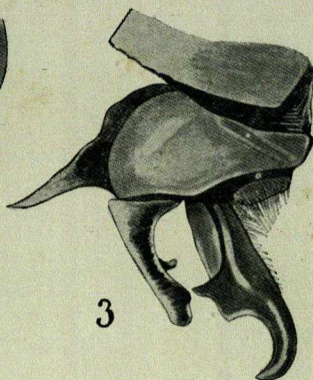
2. The same of *Idionyx intricata* Fraser, ♂, right side.
3. The same of *Idionyx optata* Selys, ♂, right side.
4. The same of *Idionyx intricata* Fraser, ♂, dorsal view.
5. The same of *Idionyx galeata* Fraser, ♂, dorsal view.
6. The same of *Idionyx optata* Selys, ♂, dorsal view.
7. The same of *Idionyx corona* Fraser, ♂, right side.
8. The same of *Idionyx selysi* Fraser, ♂, right side.
9. The same of *Idionyx imbricata* Fraser, ♂, right side.



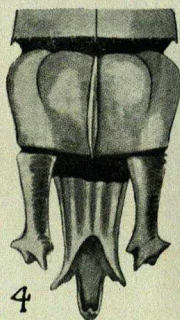
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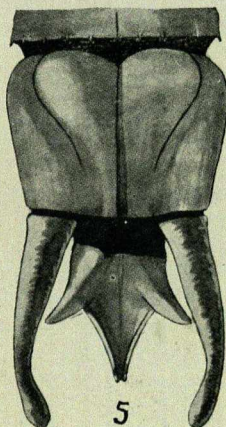
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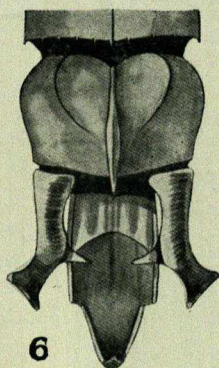
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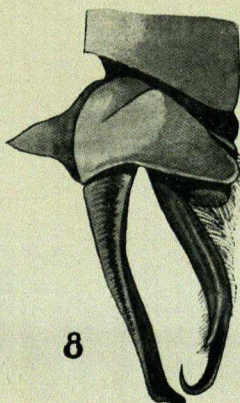
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[Vol. III. of the first edition was never completed. A second edition, by Mr. N. D. RILEY, Brig.-Gen. W. H. EVANS, and Mr. G. TALBOT, is in course of preparation. This edition will embrace all the Butterflies and will probably extend to five volumes.]

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Carabidæ: Vol. I. Carabinæ. By H. E. ANDREWES. Pp. i-xviii, 1-431, 9 pls.,
text-figs. 22/6 May 15, 1929.

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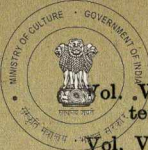
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- [A volume on the Ticks, by Dr. M. SHARIF, is in course of preparation.]

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- [A fifth volume, by Dr. B. PRASHAD, dealing with Pelecypoda, is in active preparation.]

WORMS.

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