

NEW AND LITTLE KNOWN *ODONATA* OF THE ORIENTAL
AND AUSTRALIAN REGIONS.

By

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Fam. LIBELLAGINIDAE.

Rhinocypha phantasma, sp. n.

Material examined: — 3 ♂, 2 ♀ (ad.), S.E. Celebes, Boeton I., Dwaalbaai, Jan. 19, 1917, native collector (ex coll. J. LINDEMANS & D. C. GELJSKES).

Allied to *R. monochroa* SEL. and *frontalis* SEL., but easily distinguished from these species by the curious hoar-frost like pruinescence on the dorsum of the abdominal segments.

Male (ad.).— Anterior surface of head shining black, without any pale markings except a blue point on either side of the clypeus, almost touching the margin of compound eye; upper parts, including the dorsal surface of the clypeus, deep velvet-black, with no other pale markings than 4 blue points, one on each side, just behind the posterior ocelli, and one on each side upon the middle of the occipital lobes. Rear of the head pruinose white.

Prothorax black with an oval bluish spot on either side anteriorly, placed in the long axis, and a blue lateral point below posterior lobe. Synthorax black with slight bronzy reflections above. Sides with a continuous, irregular, bright blue fascia over the stigma; this band begins immediately above the coxae of middle pair of legs, forming a small triangular point in the lower corner of the mesinfraepisternites; from here it continues to behind, crosses the first suture, occupying only the lower half of each mesepimerite, filling up the lower half of the metepisternites (including the spiracle), and finally covers the dorsal two-thirds of each metepimerite. Metinfraepisternites black, as is also a narrow strip along ventral border of the metepimerum. Poststernum black with a blue spot upon middle.

Legs black, not dilated; distal two-thirds of each of the middle and posterior tibiae pure white interiorly.

Wings shaped as in *frontalis* SELYS; bases, to a level of about 3-5 cells proximal to the nodus, tinged with yellow, the costal space being coloured thus as far out as the nodus; remainder of the membrane uniform and opaque dark brown, with blue and reddish-purple reflections on upper- and lower side of front wings, brilliantly golden and brassy on the hind wings, especially on the underside of the latter. Pterostigma black, covering 9-10 underlying cells.

Abdomen, dorsum black; all segments except 1 and 10, overlid with a

chalky bluish-white pruinescence, which produces an effect as if the upperside of the body were similarly coloured to the sides. The intersegmental membranes and lateral carinae of all segments, as well as the bases and extremities of segm. 8 and 7 are less heavily pruinose, so that the black ground-colour is shining through on these parts. Lateral surfaces of the tergites 1-8 bright greenish-blue (Bremen Blue in RIDGWAY); on segm. 1-4 these markings cover the entire surface and are merely interrupted by the black intersegmental membranes; the distal edges of the spots on segm. 5-8 are progressively, though slightly, more rounded off, and the smallest spot (on 8) is rather narrow and does not reach the apical margin of the segment. Segm. 9-10 and apps. black. Sternites all black.

Female (ad.) — Differs from the ♂ as follows. In addition to the small yellow points on the anterior and dorsal surfaces of the head, there are two small and widely distant spots on the middle of the frons. A short yellow line along upper four-fifths of the humeral suture, and the lateral pale fascia bright yellow instead of blue. Legs entirely black.

Basal half of all wings tinged with yellow; this colour rather abruptly changing into brown so as to form a broad, dark brown band, which — in front wing — occupies the 8th to 10th *Px* prominal to *pt*; in hind wing this band covers the entire distal half of the wing, only the apical border, distal to *pt* being milky-white in colour. Tips of front wings hyaline, distal border also milky-white. Basal two-fifths of *pt* black, remainder ivory-white.

Abdomen with the mid-dorsal carinae of segm. 3-5 finely yellow, and with the sides also variegated with greenish-yellow. Sides of 1 with only one, of 2-4 each with three yellow spots: the basal one transverse, the upper one angulate and prolonged apicad, the posterior one isolated and rounded; 5-7 each with a triangular yellow spot along lower margin and a narrow transverse streak along base. Sternites and segm. 8-10 all black.

Length: ♂ abd. + app. 19, hw. 21.5-22; ♀ 17.5, 23.5 mm.

The male of this new species is distinguished from *frontalis* by its smaller size, by the absence of blue spots on the upper surface of frons, and by the bluish-white pruinescence on the back of the abdominal segments. *R. frontalis* further differs from our species in that the blue lateral fascia of the thorax is more extensive and distinctly forked behind, the side-spots of the abd.-segments 6-8 being also different in shape: cut-off obliquely and rather pointed to behind; moreover, the 9th segment bears an additional blue side-spot in the ♂ of *frontalis*, whereas in *phantasma* this segment is entirely black.

Rhinocypha frontalis SELYS.

1873. SELYS, 3me Add. Syn. Calopt. p. 26-27 sep. — ♂♀ "Moluques"; Menado (N. Celebes).

1916. RIS, Entom. Mitteil. 5, p. 311 (key), 312-313 (descr. and full references). — ♂♀ N. and C. Celebes).

As hinted at by RIS (loc. cit.), the occurrence of this species in the Moluccas and the Philippines (LUZON) needs confirmation.

Material examined: — 1 ♂ N. Celebes, Manado; 10 ♂, 5 ♀, id., Tondano, July 1933, and June 1935, C. VAN BRAEKEL leg.; 1 ♂, 1 ♀, id., Manembo, near Manado, 6 - 800 m, July 20, 1935, P. ZONDERVAN leg.; 1 ♂, 1 ♀, S.E. Celebes, Boeton I., Febr. 2, 1917 (ex coll. J. LINDEMANS & D. C. GELJSKES).

All males agree perfectly with the original description as given by DE SELYS. The species is easily distinguished from *monochroa* by the presence of two squarish — or somewhat rounded — bright blue spots upon the middle of the frons, in front of the ocelli. Traces of a blue antehumeral stripe are usually present in the lower corner of each mesepisternite, but sometimes they are reduced so much as to be almost absent. *R. frontalis* is further distinguished from *monochroa*, and *phantasma* as well, by the forked appearance of the lateral blue fascia of the thorax, the dorsal portion of which is continued upwards between the bases of front and hind wings, covering almost the entire median space of the metepisternites.

The ♂ from Boeton differs not in any way from our specimens of N. Celebes, except in the length of the antehumeral spots, which are in the form of narrow stripes, extending over the lower two-thirds of each mesepisternite.

The ♀ differs from typical examples in that the basal third of all wings is brown instead of yellow, only the extreme bases being of a more yellowish tint; this colour gradually deepens further distad to become dark brown between nodus and pterostigma. The tips of the front wings are hyaline and milky-white as far inward as ca 6 cells proximal to *pt* while only the extreme border of the hinder pair are milky-white.

R. monochroa SELYS, of which I have seen a fine series of specimens from Central and South Celebes, though allied to *frontalis*, is doubtlessly quite distinct from that species. In Central Celebes (Tolitoli and Paloe), both species have been found, so that the areas of distribution seemingly overlap in that part of the island.

By the absence of any blue dorsal spots on the abdominal segments and by their much larger size and more elongate wings, *monochroa*, *frontalis* and *phantasma* are well distinguished from the eastern species *tincta* RAMB., and its races.

Fam. MEGAPODAGRIONIDAE.

Podolestes orientalis SELYS (fig. 1 - 2).

Chief references:

1862. SELYS, Syn. Agrion. Podagrion, p. 40 sep. — ♀ 'Malaisie'.
 1886. SELYS, Rev. Syn. Agrion., p. 89 - 90 sep. (♀ only). — ♀ juv., S. Borneo, Laboean.
 1889. SELYS, Ann. Mus. civ. Genova, 27, p. 479. — ♂♀ Riouw Archip. ("Kiour, résidence de Linga").
 1898. KRÜGER, Stett. ent. Zeitg. 59, p. 98 - 99. — ♂♀ N.E. Sumatra.
 1927. RIS, Zoöl. Meded. Leiden, 10, p. 15 - 16. — ♀ C. Sumatra, fig. 7 (wings).
 1931. LAIDLAW, Journ. Fed. Mal. States Mus. 16, p. 184. — ♀ Pahang, notes.
 1935. LIEFTINCK, Misc. Zool. Sum. 42 - 43, p. 6. — ♂ S. Sumatra notes.



Material examined: — 1 ♂ (ad.), W. Billiton I., Tjeroetjoek, Sept. 5, 1935, F. J. KUIPER leg. — 2 ♂ (ad.), 1 ♀ (juv.), W. Borneo, Singkawang, forest-marsh near Bakoean and Tjapkala Rd., Febr. 19 & July 20, 1932 (♂♀), and Oct. 16, 1933 (♂), — 4 ♂ (ad.), S. Sumatra, southern Lampongs, Semangka Bay, Kotaägoeng, Dec. 26, 1934, AUTHOR leg.

The type of this species is a ♀ collected by E. R. WALLACE in 'Malaisie', without further indication of habitat. This specimen is still in the Brussels Museum collection. A second ♀ was described by DE SELYS in 1886 from S. Borneo, while the first notes on the male's structures appear in that author's "Odonates de Sumatra", published only few years later; these notes were compiled after an examination of specimens collected in the Riouw Archipelago; the description, however, is insignificant and no measurements were given. RIS's account of a female from Central Sumatra is very full, but the only adequate description of the ♂ of *orientalis* is found in KRÜGER's report on Sumatran *Odonata*.

Our series of specimens can be divided into two groups, which are rather different in colouring as well as in size. Recently, however, I have received a single ♂ of this species from Billiton Island, which in many respects is intermediate between our specimens of Borneo and Sumatra. Since neither complete descriptions nor drawings of the ♂ anal appendages have so far been published, the following additional notes may be of some use.

Male (W. Borneo). — Size relatively small. Head bronzy-black. Labrum, mandible-bases, anteclypeus and genae bright chrome-yellow, this colour narrowly continued upwards against the margin of compound eyes; labrum finely bordered with black. Prothorax with a broad transverse, apple-green fascia over its middle, and a median spot of the same colour upon posterior lobe.

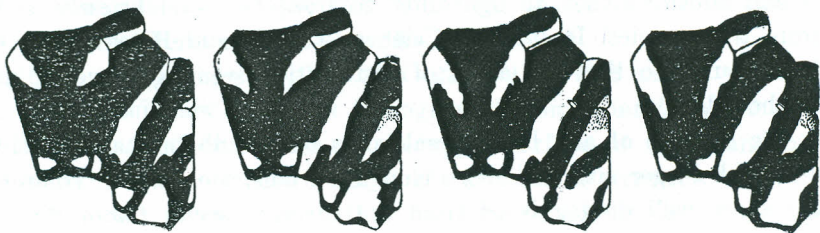


Fig. 1. — Thoracic colour-pattern diagrams of *Podolestes orientalis* SELYS, ♂ W. Borneo (left and left centre), Billiton (right centre), and S. Sumatra (right).

Synthorax bronzy-black with coppery-red reflections on dorsum. Markings sharply defined, bright blue or rather more greenish-blue, as shown in fig. 1 (left sketches). First lateral pale fascia rather narrow, irregular in outline, markedly constricted or completely divided above, and in that case forming an isolated juxta-humeral pale spot on the upper part of each mesepimerite. Thoracic sides and venter pruinose.

Legs pale brown; femora with an ante-apical brown ring and with the knees also brown.

Wings hyaline or slightly smoky. Pterostigma yellowish-brown, or wholly black. Postnodals $\frac{19-22}{19-20}$.

Ground-colour of first 5 abdominal segments reddish-brown, growing darker apically, and almost black on segm. 7-10. Segm. 1 blue, with a small mid-dorsal blackish spot; 2 with bilobed mid-dorsal spot of bright blue, occupying the basal half and with the sides also blue. Segm. 3-6 with narrow basal rings, which are distinctly bluish on the back of 3 and 4; sides yellowish posteriorly; terminal rings almost black. Segm. 7-10 black, 8 with fine mid-dorsal pale line; a complete and sharply delimited bluish spot, restricted to the dorsum, on each of the segments 9 and 10, widest at the end of 9. Apps. dark brown, not different in shape from those of our Sumatran specimens, described below.

Female (id., juv.). — Applying perfectly to SELYS' and KRÜGER's descriptions, except that the pale thoracic markings are enlarged and light purplish-blue in colour; the antehumeral bands are also longer, similar to the ♂.

Postnodals $\frac{18-21}{19}$.

Basal rings present on abdominal segments 2-7, pale blue in colour, each of them projecting to behind mid-dorsally. Dorsum of 8-10 with inverted triangular bluish spots over the entire length of each.

Valves long, though not projecting beyond the tips of appendages, their lower margin straight.

Length: ♂ abd. + app. 31-32, hw. 26.5-27; ♀ 29, 27 mm.

(Measurements of ♀ type, Malaisie: abd. 30, hw. 28 mm
 ♀ paratype, S. Borneo: — 31, — 29 —
 ♀ RIS, C. Sumatra: — 32, — 27 —).

Male (Billiton). — Differs from the Bornean specimens by its more robust build, and by the absence of any pale markings on dorsum of segm. 8-9. The spot on the back of segm. 10 is very small. Thorax warm purplish-brown with fine coppery-red reflections; markings very distinct, bright blue-green. Antehumeral stripes more elongate and longer; first lateral stripe broader (fig. 1 right centre). Sides and underparts of thorax pruinose blue. Legs pale yellowish-brown, marked similarly to the Bornean specimens. Pterostigma ochreous. Post-

nodals $\frac{19}{18-19}$.

Length: abd. + app. 33, hw. 28 mm.

Male (S. Sumatra). — The specimens of this series, in view of their large size, robust build and strikingly beautiful colours, are very conspicuous insects. The occiput, the entire prothorax and the sides and underparts of the thorax are overled with a delicate purplish-white pruinescence, so that, in some individuals, the markings are not easily made out. All agree in having the antehumeral bands narrower and longer than in the Bornean males, the pale markings of the thorax being of a bright apple-green colour (fig. 1 right).

The legs are almost entirely black while only the outer sides of the tibiae are yellow. Pterostigma jet-black. Postnodals $\frac{22-26}{21-24}$.

They further differ from examples of W. Borneo by the green basal rings of the abdominal segments being still narrower and interrupted on mid-dorsum. Segm. 7-10 and the anal apps. are wholly black.

Sup. anal apps. longer than inferior pair, strongly curved with the tips meeting or crossing each other. The inf. apps. are considerably widened behind their middle, with apices rounded; their inner and lower surfaces are golden-yellow in colour, and the lower surface is furnished with a dense bunch of soft golden-yellow hairs. Along the margin of the 10th abdominal sternite, and the

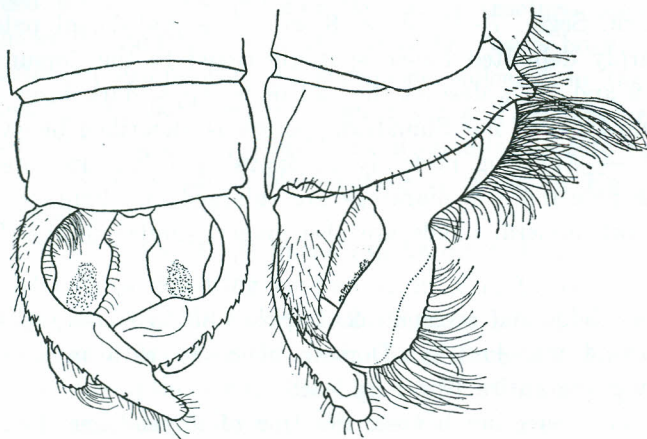


Fig. 2. — *Podolestes orientalis* SELYS, ♂ S. Sumatra. Anal appendages, dorsal view and right side.

base of inf. apps., similar tufts of golden hairs are plainly visible. About the middle of the upper side of each of the inf. apps. there is, besides, a small corrugated area, which, in the oldest individuals, is densely covered with a granular pruinescence (fig. 2).

Length: abd. + app. 35-37, hw. 30-31.5 mm.

After a comparison of Bornean examples of *orientalis* with the much stouter and rather darker individuals of the southern districts of Sumatra, I was rather inclined to regard the latter sufficiently distinguished to give them subspecific rank. The body-pattern is a little different, the legs are almost black instead of yellowish, and these features, together with the superior size of these Sumatran specimens, account largely for their different appearance. Now KRÜGER, while discussing the ♂ of Soekaranda, in N.E. Sumatra, describes the legs as "schmutzig-gelblich, an den Schenkeln aussen dunkler". The thoracic pattern of the teneral ♀, according to KRÜGER, fits well in with SELYS's description of a Bornean example. As we have seen, the Billiton specimen is intermediate in all respects, except that the legs are also pale in colour. It should be still borne in mind that the thoracic markings are not alike in any of the specimens examined, and this circumstance, together with the absence of any structural differences, obviously points to a great amount of individual colour-variation.

In view of all this, it seems best for the present to refrain from giving our Lampong series a subspecific name, the more so as the type-locality of *orientalis* is unknown.

While collecting near Kotaägoeng, my attention was first drawn to this insect by seeing a large Zygopteron, resting in a Lestid position on a bare twig among the tangly growth of shrubs overhanging a very small muddy brook,

flowing through secondary forest. The insect rested with its wings half outspread, so that I first thought it was a *Lestes*. Three other specimens were caught not long afterwards over the same brook, and a single female was observed while ovipositing in the bark of a rotten branch, few inches above the water's surface; unfortunately I failed to secure it.

Apparently, *P. orientalis* has a wide distribution in Malaysia, ranging from Pahang in Malaya, through the whole of Sumatra and the Riouw Archipelago, to Billiton I. and Borneo.

Podolestes chrysopus SELYS (fig. 3).

Chief references:

1886. SELYS, Rev. Syn. Agrion. p. 89 sep. (♂ only). — ♂ Sintang, W. Borneo (*orientalis*).

1889. SELYS, Ann. Mus. civ. Genova, 27, p. 480. — ♂♀ W. Borneo.

1924. LAIDLAW, Journ. Mal. Br. Roy. Asiatic Soc. 2, p. 302, pl. 3 fig. 2 (wings).

Material examined: — 1 ♂ (in fragments and discoloured), Central W. Borneo, forest-marsh near Bika River, Jan. 4, 1925, H. WINKLER leg. (Mus. Hamburg). — 1 ♂, 1 ♀, W. Borneo, Singkawang, forest-marsh near Paser Pandjang & Tjapkala Rd., Oct. 27 & July 14, 1932; 15 ♂, 8 ♀, idem, forest-marsh near Bakoean, July 20 & Dec. 7, 1931; Febr. 17, July 19-20, Sept. 15, Oct. 27, 1932; Jan. 16, 1934; all L. COOMANS DE RUITER leg.

This is doubtlessly the same species as that described by DE SELYS in the "Revision" as a ♂ of *orientalis*. The types are much faded and entirely discoloured individuals, which, in his "Odonates de Sumatra", were recognized by DE SELYS as specifically distinct from *orientalis*. *P. chrysopus* has also been reported from Sarawak by LAIDLAW and HINCKS, and the first named author has published a valuable photograph of the wings after a specimen of Borneo.

Curiously enough, a complete and adequate description of this species is nowhere to be found in the literature, the only references to colours and genital structures being those published many years ago by DE SELYS, and these, too, are very fragmentary.

The fully adult male is brightly coloured about the body — as is also the female — and although the ground-colour of the thorax is almost uniformly metallic-green, both sexes of *P. chrysopus* are most conspicuous insects on account of the light blue patches and bands of pruinescence covering the occiput, the prothorax and several parts of the synthorax. The following is a description after specimens whose colours are best preserved.

Male (ad., not pruinose). — Head entirely black, with slight bronzy-green reflections. Labrum glossy black, occipital lobes also rather shiny anteriorly. An indistinct brownish spot on either side of the lateral ocelli. Antennae black. Pro- and synthorax black, upper parts of mesothorax with bronzy-green reflections. Sides also dark in colour except the mesinfraepisternites, and a small area around the spiracle on the lower portion of the metepisternites, which are dirty brown in colour. The metepimerum is likewise brown, but in

the centre lies a large, strongly constricted, bronzy-green spot which coalesces behind with the dark patch on metepisternum. Venter flesh-coloured or dirty brown.

Legs yellowish- or pale reddish-brown; outer surfaces of femora gradually somewhat darkened apically; inner surfaces of all femora and tibiae bright sulphur-yellow; tarsi blackish.

Wings hyaline. Pterostigma jet-black. Postnodals $\frac{13-15}{12-14}$

Abdomen with segm. 1-2 bronzy-green above, this colour indistinctly limited on each side, fading to brown laterally. Segm. 3-6 with a narrow yellow basal ring and with the sides also partly yellowish; dorsum with ill-limited longitudinal bronzy-black markings, which are abruptly widened posteriorly before the apex of each segment, so as to form distinct dark apical rings; dorsum of 7 also black and with a similar apical ring, sides dark brown. Segm. 8-10 and appendages bronzy-black, the basal third of superiors reddish-brown in well preserved specimens.

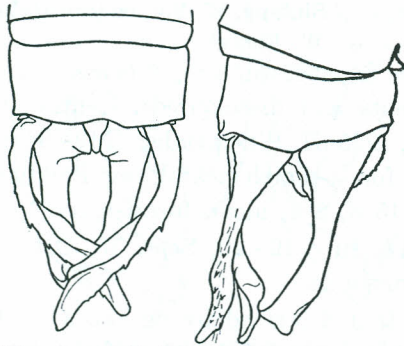


Fig. 3. — *Podolestes chrysopus* SE-
LYS, ♂ W. Borneo. Anal appendages,
dorsal view and right side.

Appendages more slenderly built than in *orientalis*, sparsely pilose, without tufts of soft hair (fig. 3).

Male (ad., pruinose). — By the delicate, light velvet-blue pruinescence covering various parts of the body, the fully

coloured male of *chrysopus* is as beautiful and conspicuous an insect as the adult of *orientalis*. Although the ground-colour of the body is of an uniform bronzy tint, the distribution of these patches of powdery substance gives the insect a very striking appearance. These pruinose-blue areas are to be seen on the following parts of the body: A narrow strip along occipital margin; the entire occiput; the whole of the prothorax (usually the posterior lobe excepted); a rounded patch on either side of the median carina upon lower third of each mesepisternite; and an oblique fascia, narrowest above, running round about the thorax, from a point just in front of each ante-alar triangle to the coxae of the posterior pair of legs, crossing the upper end of humeral suture and the spiracle. Moreover, the points of articulation of the wings, the thoracic nota, and the outer surfaces of all coxae, are pruinose blue, as well as a dorso-lateral ring on the basal third of the 2nd abdominal segment.

Female (ad.). — Differs in no respects from the ♂, except that the femora are slightly darker, reddish-brown, the colour of the interior surfaces of the legs being much duller and dirty ochreous instead of sulphur-coloured. Pterostigma usually lighter, sepia-brown.

Abdomen stout, with cylindrical segments. Segm. 8-9 blackish with a reddish-brown side-spot. Valves very long, surpassing tips of appendages for about

1 mm. Colour brownish-yellow at base, darker towards apices; lower margin slightly convex, unarmed.

Length: ♂ abd. + app. 29 - 30.5, hw. 22 - 24; ♀ (incl. valves) 28 - 29, 24 - 25 mm.

So far known *P. chrysopus* is confined to Borneo.

Fam. LIBELLULIDAE.

Nannophyopsis, gen.nov.

Size minute. Body smooth and shiny. Coloration throughout steely black, with rich coppery reflections; no markings.

Head very large. Eyes longer than wide, their median line long, almost twice longer than occipital triangle. Frons narrower than the transverse diameter of the eye, short and sloping; furrow shallowly concave. Vertex rather high, almost rounded.

Prothorax with posterior lobe moderate, larger than in *Nannophya*, slightly elevated and notched in the middle, the lobes evenly rounded and bearing a fringe of long, soft hair.

Synthorax very short and narrow, widest anteriorly, with projecting shoulders; pile short and scanty.

Legs rather long and slender; posterior femora of both sexes armed with numerous saw-like denticles interiorly, the last one being in the form of an ordinary spine. Basal half (♂) or basal third (♀) of

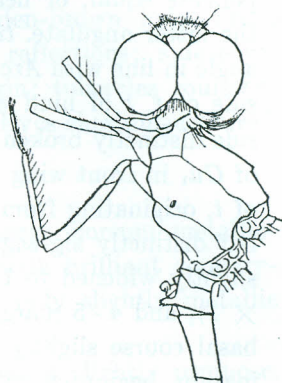


Fig. 4. — *Nannophyopsis chalcosoma*, gen. et sp. n. ♂ Anterior portion of body, showing principal structures.

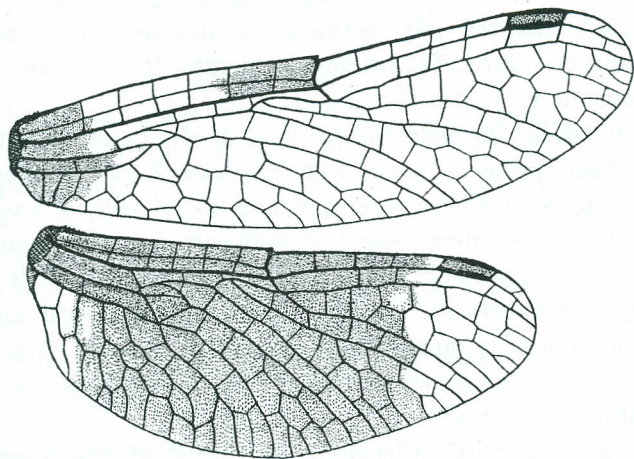


Fig. 5. — *Nannophyopsis chalcosoma*, gen. et sp. n. ♂ holotype. Right pair of wings.

middle femora with a similar row of denticles, followed by a row of 4 (♂) or 6 (♀) gradually enlarged spines, which are about as long as the space between two of them; posterior two-thirds of anterior femora with 4 - 5 similarly placed, though rather longer, spines. Armature of legs otherwise similar to *Nannophya*, the bristles more closely approximated and more numerous (e.g. middle tibiae with 8 instead of 6 bristles in *N. pygmaea*). Tarsal claws with a distinct tooth near the apex.

Wings broad. Shape of front and hind wings noticeably dissimilar; hind wing broad and considerably shorter than front wing: 2nd discoidal cross-nerve of front wing in line with the nodus of hind wing. Membrane partly coloured. Neuration open. Nodus in front wing placed at middle, in hind wing distinctly proximal to the middle of the wing. Common stalk of M_{1-3} and M_4 arising distinctly below middle of *Arc* in front wing, nearer to the middle in hind wing; fused for a long distance in both pairs. All *t*, *ti* and *ht* free. *t* of front wing distal to that of hind wing, 5-sided, with costal side strongly broken, the components equal, or nearly equal in length; proximal and distal sides subequal, the latter angulate. *ti* of front wing slightly larger than *t*, 6-sided, its proximal angle in line with *Arc*, and its costal and anal sides not coinciding with proximal side of *t*. *t* of hind wing at, or very slightly distal to *Arc*, 4-sided, the costal side distinctly broken at about $\frac{3}{4}$ of its length. *Arc* between Ax_1 and Ax_2 Origin of Cu_1 in front wing widely (σ), or but little (φ) separated from the anal angle of *t*, originating from the distal side of it. Basal course of M_4 and Cu_1 slightly but distinctly zig-zag and only little convex anteriorly; discoidal field narrow, slightly widened to the wing-margin, beginning with one row of cells (2 or 3 \times 1), and 4-5 marginal cells. Cu_1 in hind wing arising at anal angle of *t*, its basal course slightly irregular; discoidal field distinctly widened to the wing-margin, beginning with one row of cells (3 \times 1), and 4 marginal cells. Nodal index $\frac{4.6.6.4}{3.5.5.3}$. Last antenodal complete. Fork of M_{1-2} - M_3 at level between Ax_5 and Ax_6 in front wing, between Ax_4 and Ax_5 in hind wing. Common stalk of M_{1+2} strongly curved anterad in both pairs of wings. No supplementary bridge cross-vein and only 1 *Cux* in all wings. M_2 and *Rs* evenly curved towards the wing-margin. No *Rspl*. Anal loop in hind wing complete and rather long, extending far beyond level of *t*; A_1 well developed, Cu_2 and A_2 evenly curved, A_3 zig-zagged. Three basal cells between A_3 and the wing-margin; the area enclosed almost parallel-sided, and the cells between A_3 and the wing's edge distinctly disposed in transverse rows. Pterostigma moderate, longer than last postcostal space. Membranula very small.

Abdomen of σ very slender, strongly spindle-shaped, of φ markedly club-shaped. A dorsal longitudinal carina on segm. 4-9. Sternites 7 and 8 in both sexes with a distinctly impressed transverse median line and σ with a similar longitudinal impression above the lateral edges of segments 5 to 8. Segm. 8 about twice longer than 9, 10 very small and only one-third as long as 9.

Genitalia of segm. 2 prominent. Hamulus with well developed inner and outer branches. Lobus posterior narrow and projecting ventrad (fig. 6) φ with tergal margins of segm. 8 and 9 neither folded nor thickened; no vulvar scale. Ninth tergite slightly prolonged.

σ Anal appendages subequal in length, only little shorter than segm. 9 + 10, slenderly built and of simple structure.

Genotype: *Nannophyopsis chalcosoma*, sp.n.

Habitat: Billiton I.

Nannophyopsis chalcosoma, sp.n. (fig. 4-6).

Material examined: — 1 ♂ (adult), E. Billiton I. (between S. Sumatra and Borneo), Gantoeng, Sept. 17, 1935, F. J. KUIPER leg. The specimen is the holotype. 2 ♀ (one juv.), same locality, Oct. 13, 1935, F. J. KUIPER leg. One of these is the allotype.

Male (ad.). — Labium glossy black with low metallic-blue reflections. Face black, almost lustreless, labrum and anteclypeus feebly transversely striate, the latter with a brownish basal streak on middle. Postclypeus shiny metallic-green, lateral edges fringed with long, bristle-like, golden-brown hair. Frons slightly rugose, brilliant metallic-green with coppery reflections; side-edges with a brownish-yellow spot close against the eye-margin; tubercles rounded; pile short and fine, though rather dense, brown in colour. Eyes chestnut-coloured. Occipital triangle and occiput glossy black.

Prothorax black; pile greyish-yellow.

Synthorax excessively short and narrow, wholly black; dorsum metallic-green, sides throughout most intensively brass-coloured with brilliant coppery-red reflections on the mesepimerites. Venter dull black, only slightly metallic anteriorly, and thin pruinose.

Legs black; coxae and inner surfaces of anterior femora slightly pruinose.

Wings shaped as for genus.

Membrane of front wing hyaline; bases, as far out as Ax_1 and slightly over Cux , deep golden-yellow; the costal and subcostal antenodal spaces, between Ax_5 and the nodus, are also gold-coloured. Hind wing, from base to a little before the pterostigma, wholly golden-yellow, this colour fairly well demarcated distad and rather abruptly leaving off; extreme bases, posterior to the vein Cu , and as far out as A_3 , hyaline. Pterostigma rather long and narrow, greyish-brown in

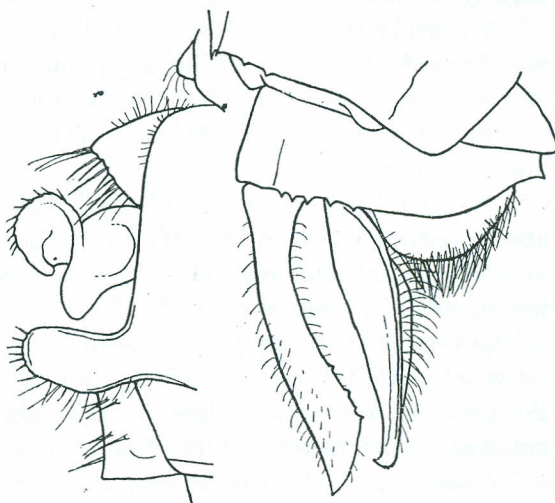


Fig. 6. — *Nannophyopsis chalcosoma*, gen. et sp. n. ♂. Left side-view of genitalia (penis omitted) and right side-view of appendages.

colour, its costal and anal margins thickened. Membranula very small, dark grey. Nodal index $\frac{4.6.6.4}{3.5.5.3}$.

Abdomen smooth and very slender, markedly spindle-shaped, almost clubbed in dorsal aspect. Segm. 1-2 rather narrow though distinctly widened in dorso-ventral dimension, width over segm. 2 0.7 mm; 3 and 4 excessively narrow, cylindrical, only 0.4 mm wide, from 5 backwards evenly but considerably widened: widest point 1.4 mm, at end of segm. 7; these segments also somewhat

enlarged in dorso-ventral dimension. Segm. 7-9 roof-shaped and ridged. Apical segments narrowed, 10 considerably so, very small and nearly annular. Venter flattened, lower portions of 8th and 9th tergites a little projecting.

Colouring black without any pale markings; segm. 2-6 shiny bronze-green, 7-9 metallic purplish-black; 10 and appendages black. Intersegmental rings pruinose-blue aside and below.

Genitalia of segm. 2 comparatively large, projecting; lobus anterior triangular in side-view, with a distinct median notch and provided with stiff marginal bristles. Hamuli approximated, their inner branches broad and rounded, with short spinulose setae along margin; tips a little outbent and swollen apically; outer branches smooth and shiny, narrower than inner ones, directed obliquely sideways, evenly rounded. Lobus posterior elongate, strongly and rather suddenly bent ventrad, provided along margin with a row of rather thick, spinulose setae. Vesicle of penis triangular, acute-angulate ¹⁾.

Anal appendages closely approximated and excessively narrow in dorsal view, superiors meeting one another slightly before apex; when seen from above each of them is nearly straight and cylindrical, with pointed tips; in side view they are but little curved, bearing 3 or 4 very low teeth along apical third of ventral margin. App. inf. about equal in length, very broad at base, side-margins slightly convex before middle, tip pointed and a little upturned (fig. 6).

F e m a l e (ad.). — Much resembling the male in size as well as in colouring. The pale spot on either side along lower margin of frons is slightly enlarged and crescent-shaped, touching the margin of compound eye.

Posterior lobe of prothorax longer, slightly more upturned and more distinctly bilobate.

Wings a little broader than in the male, especially the hinder pair. Neuration identical, except that in the front wing the vein Cu_1 originates at a point very near to the anal angle of t , whose anal side, accordingly, is not so broken; instead of this, there is, in each of the front wings of the allotype, a curved bridge-vein or "Schaltsektor", connecting the dorsal fourth of the anal side of t (at which point this side is broken) with the opposite basal portion of Cu_1 . [In the paratype ♀ such a bridge-vein is lacking and the origin of Cu_1 is again removed costad in both of the front wings].

Extension of the golden wing-markings exactly as in the opposite sex; colouring intensified: mars-yellow (RIDGWAY).

Abdomen short, with cylindrical segments. Colouring as in the male. Basal segments not widened nor inflated, narrowest at base of segm. 3 (0.6 mm!); then evenly and very considerably widened, attaining its greatest width at the end of segm. 6 (1.4 mm broad and 1.6 mm high), from which point the abdomen diminishes but little in width, giving it its definitely clubbed appearance. Segm. 10 very short and annular; appendages widely distant, with acutely pointed tips.

¹⁾ In the present specimen the penis is extruded and has been omitted from our sketch, in which, accordingly, the hamulus is perhaps shown in a slightly more forwardly bent position than appears to be natural.

Valvula vulvae not developed; eighth sternite not projecting nor produced backwards but provided along margin with two small, widely separated, knob-like prominences.

Length: ♂ abdomen 10.2 (9.5 + 0.7 app.), front wing 12.8, hind wing 10.3: 4.3, pterostigma 1 mm; ♀ 10, 13.5, 11 : 5,1 mm.

The genus *Nannophyopsis* is here established to contain a very small and surprisingly aberrant member of the *Libellulidae*. In general appearance this dwarfish insect is entirely unlike anything known in this family and there are only few genera with which it may be transiently compared, *viz.*, the nearctic *Nannothemis* and the austro-oriental *Nannophya*. These two genera, though entirely isolated in many respects, are doubtlessly allied and both are characterized by their reduced size and several venational peculiarities shared also by *Nannophyopsis*. It resembles more especially *Nannophya* in having the costal side of the triangle of the front wing distinctly broken, the common stalk of the veins M_{1+2} strongly arched towards the wing-margin, and the vein Cu_1 arising from the distal side of the front wing triangle. To me the relationship with this typically Brachydiplacine genus does not appear close, and the above enumerated characters after all are probably those of extreme specialization. In other details of venation the most obvious points of difference are found in the dissimilarity of the front and hind wings in *Nannophyopsis*, the longer and differently shaped pterostigma, the origin of Cu_1 in hind wing at the anal angle of t , the presence of a complete anal loop, and the very narrow anal field of the hind wing.

Nannophyopsis is further abundantly distinct from *Nannophya* — and *Nannothemis* as well — by its uniform bronzy-black colours, and its entirely different body-proportions. The head is much larger, while the great development of the compound eyes culminates in the median eye-line being considerably longer than in the members of these genera. The body of *Nannophyopsis* is almost smooth, whereas *Nannophya* and *Nannothemis* are hairy and comparatively robust and compactly built insects. Lastly, the narrowness of the thorax and the excessive constriction of the strongly clubbed abdomen are quite unique among the *Libellulidae*. These characters, together with the conspicuous golden patches upon the wings, give this insect a remarkably handsome appearance.

In the existing literature I have found only one description and sketch of a dragonfly whose characters and outward appearance would seem to correspond fairly well with our specimens of *Nannophyopsis*. This is *Nannodiplax clara*, described on p. 120 and figured on pl. 12 of J. G. NEEDHAM's "Manual of the Dragonflies of China" (Zool. Sinica, Ser. A, vol. 11, fasc. 1, Peiping, 1930). This species, of which only a single female has been described from Soochow in China, bears a quite striking superficial resemblance to *Nannophyopsis*, so much so in fact that the similarity of some characters suggests real affinity with *Nannophyopsis*. These characters are:

Entire body bronze-green without pattern;

Hind wing distinctly shortened and membrane of both pairs with almost identical golden-yellow spots;

Large head and spindle-shaped abdomen;

Open neuration, narrow wing-bases, rather similarly formed and much broadened hind wings, with a long anal loop and narrow, parallel-sided anal area;

Simple curving of main veins, reduced number of ante- and postnodal cross-nerves, large pterostigma.

Thus, this species shows distinct relation with *Nannophyopsis* and *ipso facto* there is no real doubt about NEEDHAM's species being incorrectly determined as a *Nannodiplax*.

Characters not shared by *Nannophyopsis* are:

Size larger (abd. 14, hw. 17 mm);

Triangles and subtriangle normal, costal side of *t* in front wing only slightly and very unequally broken;

*Cu*₁ arising at anal angle of *t* in both pairs of wings;

Two rows of cells in the discoidal field of front wing;

Two rows of cells between distal course of *A*₃ and the wing-margin;

No costal convexity of the foot-stalk of *M*₁₊₂;

Forking of *Cu*₂ and *A*₁ in hind wing almost under a right angle.

These characters, on the other hand, separate *N. clara* decisively from *Nannophyopsis*. It is indeed very unfortunate that only the female of NEEDHAM's insect is known; its separation from the genus *Nannodiplax* seems necessary, but the erection of a new genus to include it is better postponed till more material is available and constant characters can be detected. I do not think it at all probable that *N. clara* can remain in the *Sympetrini*. The inter-relationships of the Old- and New World genera still united in the heterogeneous assemblage of the *Brachydiplacini* are very difficult to tabulate, and although I am inclined to think that *Nannophyopsis* and *Nannodiplax clara* must take their place among the genera of this tribe, I cannot at present indicate their exact position much more clearly than this.

To Mr. KUIPER, of Tandjong Pandan, who gratuitously presented me with several fine collections of *Odonata* from the island of Billiton, I owe my sincerest thanks for the opportunity of studying this remarkable aberrant dragonfly. Through this gentleman's disinterested efforts I was finally enabled to study both sexes of *Nannophyopsis*, for soon after the discovery of the male Mr. KUIPER was successfully enough to secure the female in the same place.

Mr. KUIPER states that the insect was found by him along a small ditch carrying off the superfluous water of an extensive marsh, near a so-called 't e b a t' (big reservoir of the tin-workings), keeping company with *Nannophya pygmaea*.

Fam. CORDULIIDAE.

Procordulia astridae, sp.n.

1935. LIEFTINCK, Nova Guinea, Zool. 17, 2, p. 295 (key), 299 (descr. ♀). — ♀ N. New Guinea (*P. sylvia*, ♀ only!).

Material examined: 1 ♀ (juv.), N. New Guinea, Cycloop Mts., ca 1000 m alt., May 19, 1932; 1 ♂ (semiad.), same loc., April 14, 1935, W. STÜBER leg.

In the above quoted 3rd part of my monograph of the Papuan *Odonata*, I distinguished two species of *Procordulia* so far known from New Guinea, viz, *P. leopoldi* FRAS., and *P. sylvia* m., both of them being found only at high altitudes. To my description of the holotype ♂ of *P. sylvia*, which is a small and darkly coloured species, I added a description of a much larger and differently coloured ♀ which I referred to *sylvia* with some misgivings. Just after the completion of the paper, I received from Mr. STÜBER a single ♂ caught by him in the same place, and this insect now proves quite distinct from *sylvia*, corresponding exactly with the unique ♀ previously referred to that species.

The present paper affords an opportunity to include a preliminary account of the ♂ of Mr. STÜBER's species, which I propose to name *P. astridae*. A detailed description with drawings of genital structures will appear in one of the forthcoming parts of the Nova Guinea series.

Male (not fully ad.). — Immediately distinguished from *sylvia* by its superior size, much longer legs, bright metallic-green body, and different genital organs and appendages.

Head large, coloured as in *sylvia*, but with the vertex still more transverse and wholly purplish-blue. Thorax throughout brilliant metallic-green, lower parts dull reddish-brown, upper- and side-parts not so pily as in *sylvia*.

Legs long and slender, light reddish-brown in colour; knees darkened, tarsi jet-black. Hind femora 10, tibiae 9 mm long.

Wings hyaline, shaped much as in *sylvia*, but apices more pointed. Bases golden-yellow as far out as *Cux* in hind wing. Neuration similar, but the anal triangle broader and much shorter than in that species, scarcely twice longer than its width at base; the cross-nerve only little oblique, placed in the lower corner of the triangle. Membranule much as in *P. leopoldi*. Pterostigma very small, reddish-brown, equal in length to *sylvia*. Nodal index $\frac{6.11 \ 12.7}{10. \ 7. \ 7.9}$

Genitalia similar to those of *leopoldi*; the hamule is less strongly curved and the posterior lobe is narrower.

Abdomen shaped similarly to *leopoldi*; segm. 1-7 brilliant emerald-green, the metallic lustre especially vivid on segm. 1-3. Sides of 1 and lower portion of 2 brownish. Segments 6 to 9 bear indistinct reddish postero-lateral spots, while the ground-colour of 8-10 is dark brown.

Anal appendages entirely different from *sylvia*. Superior pair resembling those of *leopoldi*, though broader and widened soon after their base, each of them being provided before middle with a ridge-shaped interior projection,

about 0.8 mm in length, and a bluntly triangular exterior tooth, situated beyond the middle of each. App. inf. distinctly shorter than superiors.

Length: abd. + app. 42, hw. 38.5 mm.

It follows from the above description that *astridae* comes nearest to *leopoldi*. The latter is chiefly characterized by the velvet-black apical segments of the abdomen, the black legs and the shape of its anal appendages.

The female of *P. sylvia* is still unknown.

Macromia mnemosyne, sp.n. (fig. 7).

Material examined: -- 2 ♂ (ad.), W. Borneo, Singkawang, swampy forest near Bakoean, low country, Jan. 22 and April 9, 1934 ("at dusk"), L. COOMANS DE RUITER leg.

Belongs to group IV of *M. calliope* RIS (cf. LIEFTINCK, Tijdschr. Ent. 72, 1929, p. 65). Allied to *M. corycia* LAIDLAW.

Male (ad.). — Mouth-parts dark brown, postclypeus with two pale brownish pits. Frons entirely metallic-blue; pyramidal processes widely distant, pointed, furrow deep, inner surfaces not flattened nor framed. Vertex metallic-violet, bifid. Occiput shiny black.

Synthorax brilliant metallic-green. A very narrow buff-coloured antehumeral stripe, pointed to above and not reaching half-way up the dorsum. Most of the ante-alar triangles bright yellow. Thoracic sides with a sharply defined but very narrow yellow band across the stigma. Venter bluish-black, a whitish stripe along latero-ventral margin of each metepimerite, and a V-shaped marking upon the poststernum.

Legs very long and slender, black; tibial keels yellow; hind femora (incl. troch.) 9 mm long.

Wings tinged with greyish-yellow all over the membrane, especially in the anal angle of hind wing. A vestigial ferruginous basal spot in *c*, *sc* and *cu* of all wings. Costa black. Pterostigma small, black. Membranule long, basal one-fourth pure white, remainder grey. Anal area very broad. Anal triangle two-celled; anal margin between membranule and angle very short, slightly concave.

Antenodals $\frac{13-15}{10}$, postnodals $\frac{5-6}{8-9}$, *ht* $\frac{3}{2}$, *Cux* $\frac{5}{3}$. Anal loop 7-celled, without central cell.

Abdomen slender; segm. 2 slightly, 7-9 strongly inflated in both dimensions, widest at end of segm. 8. Segm. 1-2 black, sides of 2 with an irregular, oblique yellow marking (widest ventrally) from below upwards to the auricles, and a transverse yellow mark on mid-dorsum. Segm. 3-6 metallic-green, unmarked save for two small yellow side-spots close before and after the transverse ridge of 3. Segm. 7-10 and appendages black; 7 with a transverse basal mark of orange-yellow, confined to the dorsum, ceasing at the transverse carina and hence occupying less than the basal one-fifth of the segment. Segm. 8 with a small triangular yellow spot, placed before the middle of the segment, along side-margin, which spot is continued below, covering the antero-ventral portion of the tergite. No dorsal spine on segm. 10, the upper margin of which is straight

in side-view; the base of this segment is rather hollowed out above, but provided with a fine longitudinal ridge over its middle.

Genitalia of segm. 2 very prominent; hamulus plate-shaped, laterally compressed, very broad at base, the distal portion abruptly narrowed and very slender with slightly thickened but pointed apex.

Anal appendages, upper pair widely distant, slightly outcurved at middle, each with a very stout pointed extero-lateral tooth at about middle; tips also pointed, extreme apices either directed almost straight backwards (allotype, fig. 7), or distinctly recurved and directed a little upwards (type).

Length: abd. + app.
45-46, hw. 36, pt. 2 mm.

This fine new species is allied to *M. corycia* LAIDLAW (Journal Str. Br. Royal As. Soc. 85, 1922, p. 220, 225, fig. 5 — genit. ♂), of which only the type, a male from Sarawak (Borneo), is known. *M. mnemosyne* is immediately distinguished from it by the robust median exterior tooth of the upper appendages, which in *corycia* is situated almost at the apex. *M. mnemosyne* is the 6th representative of the genus on Borneo, and we may confidently look for more.

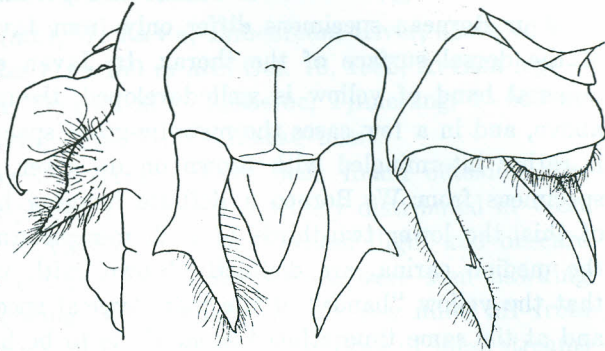


Fig. 7. — *Macromia mnemosyne*, sp. n. ♂ W. Borneo. Left side-view of genitalia, and anal appendages, dorsal view and right side.

***Macromia westwoodi* SELYS 1874.**

1929. LIEFTINCK, Tijdschr. Ent. 72, p. 62, 69, figs.

Material examined: 1 ♀ (juv.), S.W. Sumatra, Benkoelen Res., Boekit Itam near Tandjong Sakti, 650 m, July 18, 1935, Mrs. M. E. WALSH leg. — 2 ♂, 1 ♀ (ad.), W. Borneo, Singkawang, swampy forest near Bakoean, low country, Sept. 15, 1932 (♀), Mt. Poteng, 450 m alt., in dark ravine, Febr. 7 and Sept. 11, 1932 (2 ♂), L. COOMANS DE RUITER leg.

This is the first record of this species for Sumatra as well as for Borneo. As has been pointed out in my paper on Malaysian *Macromia* (loc. cit.), it is still a matter of doubt, without an examination of KRÜGER's ♂ of *Macromia westwoodi* from Soekaranda in N.E. Sumatra, whether this specimen belongs to *westwoodi* or might be the same as *cydippe* LAIDLAW, with which it is closely related. The occurrence of one of these species, or both, on Sumatra was very likely, but the discovery in Benkoelen of the true *westwoodi* fills up the long existing break in the continuity of its known distribution.

M. westwoodi was hitherto only known from Penang and Perak in Malaya, and from Java, where it is a scarce species in virgin forest; it breeds in leaf-bottomed forest-pools with clear water.

The single ♀ of Sumatra, although being in a teneral condition, could be identified as this species with absolute certainty. So far as colours are concerned I cannot find any differences with specimens from Java, but, as has been mentioned in my previous description (l.c. p. 70), *westwoodi* is easily recognized by the curious apical curving of the main veins of its wings (especially M_3 and M_4 in hind wing), and in our female this peculiarity is well demonstrated.

Our Bornean specimens differ only from Javan individuals by the colour of the dorsal surface of the thorax. In Javan examples an incomplete oval humeral band of yellow is well developed, though often not sharply defined above, and in a few cases the metallic-green space between these yellow bands is rather intermingled with brown on its lower portion. In the three mature specimens from W. Borneo a definite humeral band is wanting, and instead of this, the lower two-thirds of each mesepisternite, except on both sides of the median carina, are distinctly brown, with very faint metallic lustre, so that the yellow "bands" of the more typical specimens appear much enlarged and at the same time effaced so much as to be hardly traceable. As, however, the genitalia and appendages are exactly identical in our examples of both islands, I do not even think it advisable to ascribe subspecific value to the colour-difference just mentioned.

Mr. COOMANS DE RUITER informs me that one of the males from Bakoean, like the foregoing species, was taken by him at dusk.

Macromia cydippe LAIDLAW 1922.

1929. LIEFTINCK, Tijdschr. Ent. 72, p. 63, 73-76, figs. — ♂ Borneo, Banka.

Material examined: — 1 ♂ (not fully adult), W. J a v a, Tjibarangbang River, about 7 km. West of Djasinga (Buitenzorg Res.), ca 150 m alt., May 26, 1935, AUTHOR leg.

This is a very scarce species of which only few specimens were known with certainty, viz, one ♂ from Sarawak (Borneo), one from British North Borneo, and one from the island of Banka ¹). The female has not yet been described.

Our Javan specimen is new to the fauna of that island, which now includes no less than 6 species of *Macromia*. It is not appreciably different from the two males discussed by me earlier, and the characteristic genital structures correspond exactly with my drawings of these organs. Perhaps the appendix inferior is still a trace longer than in the male from Borneo, but I can find no other discrepancies.

The nodal index is $\frac{6.15.14.6}{9.10.10.10}$; *Cux* $\frac{66}{44}$; *ht* $\frac{33}{21}$.

Length: abd. + app. 44, hw. 40, pt. 2.5 mm.

This unique specimen was first seen into the gravelly bed of the Tjibarangbang; it was hawking wildly over the stream but finally came to rest,

¹) In Treubia, 14, 1934, p. 461, the record 'Banka' for *M. westwoodi* is erroneous and should be withdrawn.

some 12 ft. high, among the foliage of a small tree overhanging the water. It was the only specimen observed.

Macromia septima MARTIN 1904.

1929. LIEFTINCK, Tijdschr. Ent. 72, p. 67 (key), 100-103, figs. — ♂♀ Java.

1934. LIEFTINCK, Treubia 14, p. 434. — ♂♀ Java, notes.

Material examined: — 1 ♂ (ad.), W. J a v a, Tjibeureum River, about 10 km S.W. of Djasinga (Buitenzorg Res.), ca 150 m alt., Oct. 16, 1935, AUTHOR leg. — Several ♂♂, W. Java, Djampang Tengah, Mts. Tjisoeroe, Tjimerang, 4-600 m, captured during most of the year, Mrs. M. E. WALSH misit.

Of this species, which does not seem to have been found outside Java, little was known of its breeding-places. It is possibly widely distributed in West Java but easily escapes notice in view of its rapid restless flight and obscure colouring. A single male was captured and a few others were seen hawking over a stream near Kembangkoening. This locality is only few miles off from the neighbouring Tjibarangbang where I took *M. cydippe*. Both of these streams flow slowly through flat country and the beds are closed in by overarching trees and scrub, through which the sun penetrates only in places. In the dry season the water is shallow, and, when flying up and down the river, the *Macromias* appear and disappear rapidly as the sun comes out or goes in. The males of this insect disport themselves in the air with astonishing speed and are very difficult to catch.

Macromidia fulva LAIDLAW (fig. 8).

1915. LAIDLAW, Proc. Zool. Soc. London, p. 29-30, fig. 3 (wings ♂). — ♂ Mt. Kina Balu (N. Borneo).

1920. LAIDLAW, Idem, p. 319. — ♀ Mt. Matang (N. Borneo).

Material examined: — 1 ♂ (nearly ad.), 1 ♀ (juv.), W. B o r n e o, Singkawang, Bagak River, Mt. Poteng-Mt. Raja complex, ca 350 m alt., June 25, 1932, L. COOMANS DE RUITER leg.

The unique male of this remarkable little species was captured by Mr. COOMANS on the same day as the female, along a small river. The female is slightly immature and the abdomen is not fully coloured, but the male has remained in an excellent state of preservation, displaying a fine colour-pattern of metallic green and various shades of brown.

M a l e. — Slightly smaller than the type: abd. + app. 35, hw. 32.5, pt. 2.7 mm. Nodal index $\frac{11.20.18.11}{14.11.11.17}$; *Cux* $\frac{2.2}{3.3}$; *ht* $\frac{2.3}{1.2}$; anal loop 8-celled, without central cell. Membrane slightly suffused with yellow all over. Golden brown basal spots not extending beyond first antenodal cross-vein in *sc*, faintly developed in *c*, *cu* and *m*. Wings otherwise as in the type.

Body-colouring not different from LAIDLAW's description of the type. Legs with nearly the distal half of the fore and middle tibiae, and with the distal three-fourths of the posterior tibiae distinctly keeled.

Abdomen slender, markedly spindle-shaped, inasmuch as the terminal segments, from the base of segm. 6 to the base of 8 are greatly expanded laterally (width of segm. 4 slightly over 1 mm, at end of segm. 7 slightly less than 3 mm); the tenth segment is vestigial.

The genitalia of segm. 2 have not been described or figured. The genital hamule and lobe are both of them extremely small and scarcely visible; the hamulus is placed in the long axis of the body but its anterior part is transversely elevated, forming

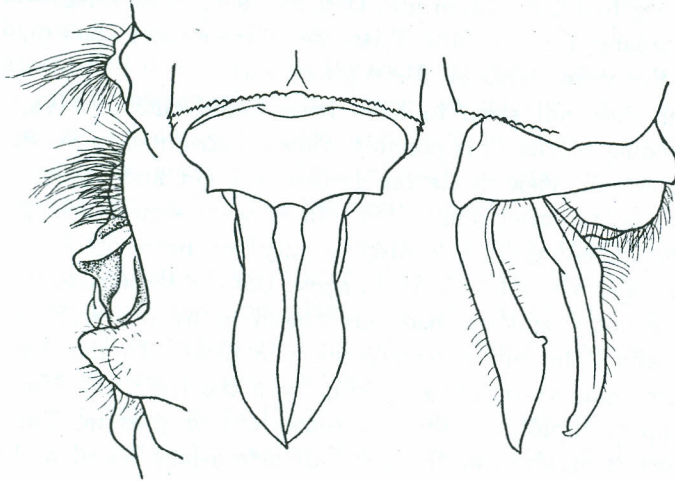


Fig. 8. — *Macromidia fulva* LAIDLAW, ♂ W. Borneo. Left side-view of genitalia, and anal appendages, dorsal view and right side.

sely elevated, forming an inwardly bent and strongly curved end-hook whose apex is black; between the hamuli a paired median body is visible in side-view, which probably is the proximal portion of the penis (fig. 8).

A drawing of the anal appendages is also given here for the first time (fig. 8).

Female. — Similar to the male in most respects. Wings almost colourless except the bases, which are yellow, and a golden-brown patch in *c* and *sc* to a level between Ax_2 and Ax_3 in front wing, and between Ax_1 and Ax_2 in hind wing. Antenodals $\frac{20}{10}$, postnodals $\frac{13}{15}$; $Cux \frac{2.2}{3.3}$; $ht \frac{2.2}{1.1}$; anal loop 10-12-celled, including one or two central cells. Front wings with two rows of cells in the discoidal field up to a level of the nodus (similar to the male).

Valvula vulvae completely divided into narrowly triangular, pointed blades, which are a trace longer than half the length of segm. 9.

Abd. 34.5, hw. 35, pt. 3 mm.

Macromidia atrovirens, sp.n.

Material examined: — 1 ♀ (adult), S. Sumatra, Benkoelen residency, Boekit Itam, 6-700 m, June 11-15, 1935, M. E. WALSH leg. The specimen is the holotype.

Allied to *M. genialis* LAIDLAW, from the Malay Peninsula, but much larger.

Female. — Labium and mouth-parts ochraceous-orange, labrum tawny. Clypeus and frons cinnamon-brown, this colour upwards turning to auburn and mummy-brown; the granular upper parts of the frons almost black with

faint bronzy reflections. Vertex densely punctured, black. Antennae dark brown. Occipital triangle and occiput glossy black.

Synthorax brilliant metallic-green above and aside; an indistinct line along humeral suture, the mesinfraepisternites and the lower half of the metinfraepisternites, as well as the entire under-surface of the thorax dark reddish-brown, not metallic.

Legs black; coxae and the bases of the anterior pair of femora dark brown.

Wings strongly tinged with yellowish-brown all over the membrane; this colour most conspicuous along anterior margin and towards the apices. Pterostigma cinnamon-brown. Neuration dense, as for genus. Nodal index $\frac{12.20.19.12}{17\ 11.12.16}$;

$Cux \frac{4.4}{3.3}$; $ht \frac{2.3}{2.2}$. In front wing only one row of cells in the discoidal field (about 2-3 cells proximal to the nodus), followed by two and more cells. Anal loop containing 9-10 cells, including one central cell.

Abdomen dark in colour; segm. 1-6 shiny bronzy-black above, the three basal segments with metallic-green intermingling; sides polished. Markings very indistinct; sides of 2 largely reddish-brown, and the lower portion of the tergites of segm. 5-8 also rather ferruginous or orangish. Sternites reddish-brown. Terminal segments almost black, thicker than the preceding ones. Segm. 10 and appendages very small, subequal in length, the latter conical and pointed.

Valvula vulvae barely one-fourth as long as segm. 9, deeply and triangularly excised, so as to form two very small, rather convex blades, which are well rounded apically.

Length: abd. 36, hw. 37.5, pt. 3.2 mm.

With the new species, described above, the genus *Macromidia* now includes the following six species:

1. — *Macromidia rapida* MARTIN (Cat. Coll. SELYS, Cordul. fasc. 17, 1906, p. 79-80, fig. 92 (wings), pl. 3 fig. 18 (insect), the genotype, from Tonkin. — Size moderate: ♂ abd. 36, hw. ♂ 31-32, ♀ 35 mm. Two rows of cells in the discoidal field of front wing, up to a level of the nodus, and with 3 single cells, followed by two rows in that of the hind wing. Three rows of cells between anal loop and the wing-margin. Antenodals $\frac{16-20}{9-10}$. Body metallic-green; thoracic sides with two yellow bands. Abdomen with sharply defined, yellow mid-dorsal longitudinal spots on segm. 3-7 and a few yellow points on 2 and 8.

2. — *Macromidia donaldi* FRASER (Rec. Ind. Mus. 26, 1924, p. 515-516, fig. 6 (wings) 7c-d (apps.), from Western India. Closely allied to *rapida*. — Size moderate: ♂ abd. + app. 34, hw. 30 mm. Discoidal field of both pairs of wings beginning with a single row of cells, to a level slightly before nodus. Two rows between anal loop and wing-margin. Body much as in *rapida*, abdomen black with clear yellow spots, rather similar to those of that species.

3. — *Macromidia shanensis* FRASER (Rec. Ind. Mus. 29, 1927, p. 67-68) from Upper Burma. — Size large: ♂ abd. + app. 38, hw 32; ♀ 36, 34 mm.

Discoidal field of front wing with a single row of cells to a level of inner end of bridge. Antenodals $\frac{15-17}{9-10}$ in both sexes. Thorax metallic-green with incomplete, citron-yellow antehumeral stripe and two lateral stripes of that colour. Abdomen black, with sharply defined, mid-dorsal spots and stripes on segm. 1-3 and 6.

4. — *Macromidia fulva* LAIDLAW 1915 (*loc. cit.*, *antea*), from British North Borneo. — Size moderate: ♂ abd. + app. 35-37, hw. 32.5-35; ♀ 34.5, 35 mm. Two rows of cells in the discoidal field of front and hind wings, up to a level of the nodus. Three rows between anal loop and wing-margin. ♂ Antenodals $\frac{18-22}{11-12}$, ♀ $\frac{20}{10}$. Body-colouring pale brown; thoracic sides with two broad metallic green-brown bands. Abdomen brown, with pale brown rings.

5. — *Macromidia genialis* LAIDLAW (Journal Mal. Br. Roy. Asiatic Soc., 1, 1923, p. 232, pl. 5 (wings. genit.), from G. Tahan in Pahang, Malay Peninsula. — Size small: abd. + app. 30, hw. 27.5 mm. Female unknown. Only one row of cells in the discoidal field of both pairs of wings, to a level slightly before nodus. Two rows between anal loop and the wing-margin. ♂ Antenodals $\frac{15}{10}$. Dorsum of synthorax brown, sides metallic-blue with obscure brownish stripe along second suture. Abdomen entirely black, except on segm. 2.

6. — *Macromidia atrovirens*, of this paper, from Sumatra. — Size large: abd. 36, hw. 37.5 mm. Male unknown. Only one row of cells in the discoidal field of both front and hind wings, to a level slightly before nodus. Three rows between anal loop and wing-margin. ♀ Antenodals $\frac{19-20}{11-12}$. Body unmarked, dark in colour; thorax almost entirely metallic-green, abdomen throughout bronzy-black.

Except by its much larger size, this species differs from *genialis* by the higher nodal index, the wider and more closely reticulated anal area of the hind wing, and by details of coloration, especially of the head. Unlike *Macromia*, in the species of *Macromidia* venational differences between the two sexes are not very great, and therefore I feel myself justified to consider this species distinct from *genialis*.

Fam. GOMPHIDAE.

THE FORMENKREIS *Macrogomphus parallelogramma* (BURM.) (fig. 9-10).

In the following I have attempted to deal more thoroughly with two members of the genus *Macrogomphus* in Malaysia, viz. *parallelogramma* (BURM.) and *albarda* SELYS, which are among the best known of the genus and for this reason admit a closer study of their mutual relationship and geographical distribution. By the lack of material and sufficiently clear structural differences, systematic writers in the past had to depend largely on colour-differences and this has quite naturally resulted in the definition of a number of closely allied "species", which were often founded on specimens from different habitats (cf.

also *Ictinus*, *Onychogomphus*). The material examined consists of about 40 specimens of both sexes, mostly from Java, but also from Sumatra, Banka and Borneo. A study of these affords distinct evidence of the two "species" above referred to belonging to the same Formenkreis (*sensu* KLEINSCHMIDT!) ¹⁾.

As has been pointed out on several occasions by various writers (RIS, Tijdschr. Ent. 55, 1912, p. 162; Ann. Soc. ent. Belg. 55, 1911, p. 238-239 — *albardae*; SCHMIDT, Arch. Hydrobiol. Suppl. 13, p. 364-365, fig. 67; LIEFTINCK, Misc. Zool. Sum. XCII-XCIII, 1935, p. 19), *M. parallelogramma* is an extremely variable species so far as colours are concerned, and the sexes are often very different (cf. also HAGEN-SELYS, Mon. Gomph. p. 90-92 sep. ♂ and p. 403-405 sep. ♀). The writer has examined 13 males and 17 females from different localities in Java, and a comparison of living specimens has definitely confirmed a previous supposition that different colour-varieties crop up in the same localities, so that it is evident that the palely and darkly coloured forms cannot be accepted as geographical subspecies. It is necessary to state this first, because we meet apparently with the same phenomenon in Sumatran *albardae*. For the present purpose it is sufficient to ascertain this amount of variability for the male only; the females may differ from each other in the same way, or even more so: darkly coloured individuals of that sex are indistinguishable from Sumatran and Bornean *albardae*.

The following five males are among the darkest of our series of Javan *parallelogramma*, and even these are all different *inter se*:

♂ ad., Soerabaia (East Java).— Ground-colour jet-black. Labrum black with two isolated yellow spots. No juxta-humeral yellow point. Met-

¹⁾ In dealing nomenclatorially with the nature of a species it appears to me highly advisable to emphasize also in the nomenclatorial formula the contrast which exists between the essential species, or *Formenkreis* in LORENZ's sense (Szegsber. zool. bot. Ges. Wien 92, 1892) or in that of KLEINSCHMIDT (Die Formenkreislehre, 1926), and the less essential "cluster" of closely allied species; the second-mentioned can exist together without fusing: no other barriers keeping them apart than their own organization. The quite convenient term *Formenkreis sensu* LORENZ and KLEINSCHMIDT is adopted during the last decade by a great many systematists for those species which are liable to form subspecies (geographical or non-geographical races).

Although RIS, in his famous monograph of the *Libellulinae* used the trinomial system, thus adhering KLEINSCHMIDT's principle of defining syngenetic races as components of but a single species, he employed the term *Formenkreis* — a "cluster" or group of species — in a fundamentally different sense than KLEINSCHMIDT did.

In some of my previous papers on *Odonata* and in the present discussion of the *Formenkreis M. parallelogramma*, I have introduced this term to lay stress on a kind of geographical variation which is not easily understood; in many other cases the mutual relationship of a series of subspecies constituting a species, or *Formenkreis*, is much easier to ascertain (e.g. *Leptogomphus lansbergei* and its subspecies *assimilis*, *Neurobasis chinensis* and its subspecies *florida*), and in these instances the evidency of a *Formenkreis* being the same as our "species" needs no further comments. It is well known that many forms (in the commonest sense) now traced as subspecies have been regarded in the past as distinct though closely allied species, and the reverse, that forms now considered to be subspecies in the future might well be separated again and regarded as species. This, I think, ought not so much be a matter of convenience as of a profound study of relationships; the unstability of our conceptions goes on *pari passu* with new discoveries and a better knowledge of facts.

The use of the term *Formenkreis* as a "cluster of species" is useless and should be avoided; recently, SCHMIDT in his criticism of my treatment of the *Formenkreis Mesogomphus reinwardti*, has apparently misinterpreted the correct meaning of this term.

episternal stripe incomplete, distinct though narrow, cuneiform, almost reaching the spiracle. Occipital plate, vertex and legs black. The dorsally interrupted yellow rings on segm. 4-6 of abdomen occupy ca $\frac{1}{3}$ of the length of each segment; 7 with sharply defined yellow ring, occupying slightly less than basal half of segment, narrowly divided above by a black median line; 8 with latero-basal yellow spots distinct. Remainder black.

♂ not fully ad. ? Mt. Slamet (Mid Java).— Ground-colour black. Labrum black with two large yellow spots, confluent along base. No juxta-humeral yellow point. Metepisternal stripe as before. Occipital plate black; vertex bright yellow behind. Legs black, hind femora dark chestnut-brown. Pterostigma black! Yellow rings on segm. 4-6 not extending beyond the transverse suture, occupying ca $\frac{1}{4}$ of the length of each segment; 7 with the basal half entirely yellow; 8 with a transverse yellow spot on each side at base, occupying less than $\frac{1}{3}$ of the length; 9 with yellow basal points.

♂ ad., Mt. Slamet (Mid Java).— Ground-colour black. Labrum black with two isolated yellow spots, confluent along base. No juxta-humeral yellow point. Metepisternal stripe enlarged, reaching the spiracle. Vertex and occipital plate black. Legs entirely black. Yellow rings on segm. 4-6 enlarged, extending beyond the transverse suture for about 1 mm each; 7 as before, 8 with a basal point of yellow on each side; remainder black.

♂ ad., Malingping (West Java).— Ground-colour black. Labrum black, with two large isolated green spots at base. Postclypeus with 5 small greenish spots, 3 on middle, and 1 larger one placed on either side near the eye-margin. Vertex with a green spot behind the ocelli; occipital plate black. No juxta-humeral yellow point. Metepisternal stripe very narrow, obliterated (left side), entire and almost reaching the spiracle (right side). Legs black, all femora distinctly reddish-brown, knees black. Yellow rings on segm. 4-6 and 7-8 as before; remainder black.

♂ ad., Malingping (West Java).— Ground-colour black. Labrum black, with mere rudiments of two yellow points near base; clypeus jet-black. Vertex and occiput as before. No juxta-humeral yellow point. Antehumeral stripes very narrow. Metepisternal stripe a mere comma-shaped rudiment, greenish in colour, placed in the upper corner of that space, and ill-limited ventrally. Yellow rings of segm. 4-6 narrow, not reaching beyond transverse suture; basal half of 7 yellow; remainder black.

This is the darkest specimen I have seen from Java.

The remaining specimens of our series are not fully adult, and in them the ground-colour of the body is brown, the markings being decidedly enlarged. Neither these nor any of the females have a juxta-humeral yellow spot in the upper corner of the thorax.

M. albardae SELYS (4. Add. Syn. Gomph. p. 416-418 sep.) was founded on a male from the island of Banka, collected by TEYSMANN, and hence was

erroneously reported from Sumatra (see: LIEFTINCK, Misc. Zool. Sum. XCII - XCIII, 1935, p. 19). The allotype female is from Lahat, in Palembang, S.E. Sumatra. Both specimens are still in the collection of the Amsterdam Zoological Museum. I have compared these types with other material from Java, Sumatra and Borneo.

The type of *albardae* is a darkly coloured specimen. SELYS's description of the occiput ("légèrement renflée en tubercule mousse au milieu") applies to a very slight thickening of the hind border, which is more or less developed throughout our series of specimens from Sumatra, Borneo and Java; it is of no specific importance. The principal differences between *albardae* and *parallelogramma* have been enumerated by DE SELYS at the end of his description of the first mentioned species. According to him, the pterostigma in *alb.* is longer than in *parall.*, the black markings on head and prothorax are more extensive, and there are no traces of an intercalated yellow fascia on the thoracic sides; in addition, the yellow rings of segm. 3 - 5 of abdomen are narrower and not confluent with the dorsal yellow stripe, and there are no basal yellow spots on segm. 8 and 9; lastly, the outer branches of the sup. anal apps. of the male are more pointed and almost wholly black.

Now, it is beyond doubt, that almost all of these supposed differences are subject to considerable variation, depending largely upon the phase of maturity arrived at by the living animal; only in a few cases the variability, especially of the thoracic colour-pattern, seems also to be due to post-mortem colour-changes.

Of Sumatra the writer has examined specimens from Deli (N.E. Sumatra), Palembang and the S. Lampoeng districts. The colours of the two extremes may be described as follows:

♂ ad. Lahat (Palembang). — Not different from pale-coloured *parall.* of Java. Ground-colour dark reddish-brown. Labrum yellow, broadly margined with black. Clypeus and vertical portion of frons brownish-black. Legs black, femora brown interiorly. A juxta-humeral yellow spot present (absent in the type from Banka!). Humeral stripe equal in width to lightly coloured *parall.* from Java, but distinctly narrower than in the type of *albardae*. Yellow metepisternal stripe very distinct, though narrow and cuneiform, reaching half-way down the spiracle. Yellow rings on segm. 4 - 6 conspicuous, surpassing the transverse sutures for about 1 mm, occupying the basal third of each segment. Ground-colour of segm. 9 - 10 brown, 9 without basal yellow spots.

♂ ad. Mt. Tanggamoës (Lampoeng). — Scarcely different from the darkest colour-variety of Javan *parall.*, but pale markings slightly more extensive. Markings of head and thorax olive-green. Labrum black with two large, isolated basal spots; clypeus and frons black, the postclypeus with merest rudiments of some greenish points. A very small juxta-humeral greenish point present on both sides. Antehumeral stripes narrow. Metepisternal fascia narrow but distinct, comma-shaped, confined to the upper

half of each episternite. Legs black, femora so much darkened as to be also nearly black. Ochreous-yellow rings on segm. 4-7 enlarged, indistinct dorsally, in side-view occupying nearly the basal half of each segment. Segm. 8 with a small yellow basal spot each side; 9-10 black.

The known Bornean specimens of *albardae* agree with typical *parallelogramma*, and with the type of Banka as well, in that a juxta-humeral yellow point is wanting, but in our Bornean males the ground-colour of the body is distinctly dark reddish-brown, except the mesepisternites, which are black. (See also RIS, Ann. Soc. ent. Belg. 55, 1911, p. 239). The labrum is reddish-black or reddish-brown, without distinct yellow spots, only the lateral edges being somewhat paler in colour. In this respect the type from Banka comes nearer to the Bornean form than to the Sumatran and Javan individuals. There are

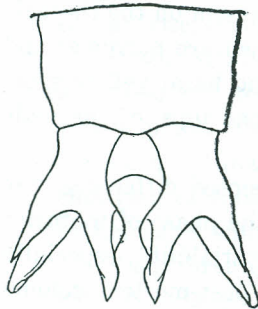


Fig. 9. — *Macrogomphus parallelogramma albardae* (SEL.), ♂ W. Borneo. Anal appendages, dorsal view.

no traces of a pale metepisternal stripe. (Two adult males, W. Borneo, Singkawang, near Penaring, along small stream, Febr. 24, 1932, and in open country near the forest-marsh of Bakoean, Sept. 15, 1932, L. COOMANS DE RUITER leg.).

As we have now seen, the differences between *parallelogramma* and *albardae* are very slight and unstable. The genital organs of the 2nd abdominal segment of the male are exactly identical, and the size is approximately the same throughout our series of specimens. The different size of the pterostigma, as mentioned by DE SELYS, is useless as a specific, or even subspecific character (♂ Java 3.75-4.40, ♀ 4.40-4.75; Banka ♂ 4, Lahat ♀ 4.50 mm).

In the writer's opinion, the only difference that may be relied upon as a character separating *albardae* from *parallelogramma*, is that found in the upper anal appendages of the male, and mentioned already by DE SELYS in the original description. In *parall.* the outer branch of the sup. apps. is only little shorter than the inner branch and at the same time slightly more robust and less acutely pointed (all specimens from Java and the two males from S. Sumatra), whereas in *albardae* the outer branch is slenderer, usually distinctly shorter than the inner, and very acutely pointed (type of Banka, ? Sumatra, and Borneo). This character, slight as it really is, may perhaps be used as a subspecific means of distinction between two geographically separated races, the males of which are generally to be recognized thus:

1. Ground-colour of the body of the adult male deep black. Pale markings on the black labrum well-defined, though often much reduced. Usually at least traces of an incomplete metepisternal yellow stripe. Appendages as above. Java, S.E. and S. Sumatra *parall. parallelogramma*.
2. Ground-colour of the body of the adult male dark reddish-brown, except on the back of synthorax. Labrum of the same colour, without sharply

defined yellow spots, though sometimes indistinctly green or yellowish on both sides. No traces of a metepisternal yellow stripe. Appendages as above (fig. 9). Penins. Siam, N.E. Sumatra, Banka, Borneo *parall. albardae*.

Although intermediate specimens are very likely to turn up in Sumatra, I would propose to retain the name *albardae* for the above defined subspecies.

Macrogomphus phalantus, sp.n. (fig. 10 - 12).

Material examined: 2 ♂, 1 ♀ (ad.), W. Borneo, Singkawang, swampy forest near Bakoean, low country, July 20 (1 ♂, "at dusk") and Sept. 15, 1932 (one pair, type and allotype), L. COOMANS DE RUITER leg.

Closely resembling *M. parallelogramma albardae* SELYS, but much smaller and with differently shaped anal appendages.

Male (ad., type).—Labium dirty ochreous; mandible-bases yellow. Labrum dark reddish-brown in the centre, growing paler laterally and along distal margin, so that two large but ill-defined ochreous spots are clearly discernible, each of them filling up the side-edges.; distal border fringed with golden hair. Anteclypeus greenish brown, postclypeus dark reddish-brown, except the side-edges which are yellowish-green. Frons in front blackish-brown; horizontal portion entirely bright green. Vertex and occiput reddish-black, unmarked. Behind the eyes chestnut-coloured.

Prothorax brownish-black, with the anterior border finely yellow and with a yellow point on the hinder part of the mid-dorsum; posterior border with some dark reddish points.

Synthorax throughout deep reddish-black, with well-defined dull greenish-yellow bands above and along the sides, as shown in fig. 10. Venter black. Lower lateral and ventral surfaces of thorax slightly pruinose blue.

Legs black; coxae brown and femora indistinctly reddish at base.

Wings tinged with greyish-brown all over the membrane, especially at apices. Pterostigma very dark mummy-brown, unbraced, covering 4-5 underlying cells. Neuration very similar to *parallelogramma*. Anal loop consisting of but one small, roundish cell, and only one, slightly larger cell between this and the anal triangle. Three rows of cells between the proximal portion of Cu_2 and the wing-margin. Nodal index $\frac{10.17.17.11}{11.13.11.11}$. Additional Cux $\frac{2.2}{1.1}$. Anal triangle 3-celled. Triangle of front wing more transversely placed than that of hind wing, with costal side distinctly shorter than proximal side; triangle of hind wing normal.

Ground-colour of abdomen black; only segm. 1 is rather more brownish laterally. Segm. 1 with a mid-dorsal, dull-greenish spot and a large latero-ventral mark, indistinctly limited to above. Segm. 2 with a longitudinal mid-

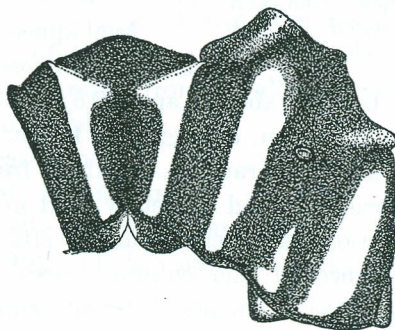


Fig. 10. — *Macrogomphus phalantus*, sp. n. ♂ W. Borneo. Colour-pattern diagram of synthorax.

dorsal mark of the same colour, which is suddenly narrowed at $\frac{2}{3}$ of its length, running from end to end; a large green lateral spot, occupying the basal half of the segment and including the auricles, and a short, isolated, transverse side-stripe along the distal margin. Auricles as in *p. albardae* but more rounded.

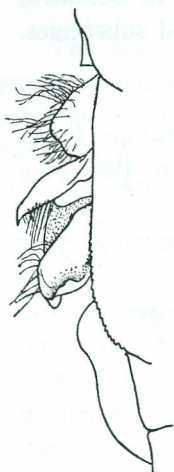


Fig. 11. — *Macrogomphus phalantus*, sp. n. ♂ W. Borneo. Genitalia of segm. 2, left side-view.

Segm. 3 - 7 with complete, dull orange basal rings, occupying slightly over $\frac{1}{4}$ of the length of segm. 3 - 6, quite half the length of segm. 7, the ring on 7 being divided longitudinally by a fine black dorsal line. Segm. 8 - 9 reddish-black, 8 with an ill-limited latero-basal ochreous spot, and 9 with a similar but still smaller spot on either side at base. Segm. 10 reddish-black, with traces of two reddish spots on mid-dorsum.

Genitalia: identical in shape to *parallelogramma* and its subspecies *albardae*, though all parts comparatively smaller. Anterior lamina rounded in side-view. Anterior hamuli resting upon the ventral process of the penis, which is only partly visible; each is slender, hollowed out ventrally, and much more projecting than the anterior lamina. Posterior hamuli of about the same length, lateral margins of each rather irregularly denticulated and curled anterad, when seen from aside (fig. 11).

Anal appendages (fig. 12), superior pair yellow, the inner branches almost black. Inferior appendage black.

Length: abd. + app. 40.5, hw. 33 pt. 4.1 mm. Length of segm. 8 3 mm, of segm. 9 6 mm, of segm. 10 1 mm.

Male (paratype). — Differs from the type only in that the mandible-bases are green instead of yellow, and in that the comma-shaped spot in the upper corner of the metepisternum is effaced. There are dirty ochreous basal rays in the subcostal and cubital spaces of the wings. Neuration not different; additional

Cux $\frac{23}{22}$

Length: abd. + app. 41, hw. 34.5 mm.

Female (ad., allotype). — Differs slightly from the male, as follows:

Colouring of the anterior surface of head somewhat lighter, olive-brown; pale markings dull green. Occipital lamina produced behind, forming a distinct median projection, which itself bears two small and closely approximated knob-like tubercles. Pro- and synthorax dark purplish-brown; markings not different from the male, bright yellow instead of green.

Wings slightly greyish-yellow with short yellow rays in *sc* and *cu*. Nodal index $\frac{13.18.18.11}{10.13.12.11}$. Additional *Cux* $\frac{2.2}{1.1}$.

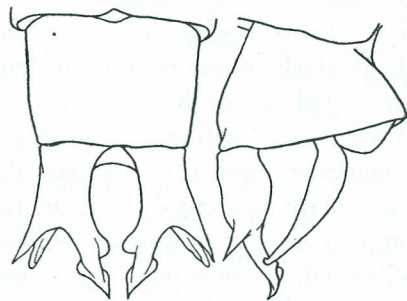


Fig. 12. — *Macrogomphus phalantus*, sp. n. ♂ W. Borneo. Anal appendages, dorsal view and right side.

Abdomen similar to the male; segments 3-7 in addition to the yellow basal markings with mid-dorsal yellow line. Side-spots of segm. 2-3 enlarged, those on 2 covering most of the sides, those on 3 approximately their basal half. Segm. 8 black, unmarked, 10 and appendages pale brown.

Genital valve not developed, margin very slightly notched at middle.

Length: abd. 43, hw. 35, pt. 4.3 mm.

Of the genus *Macrogomphus*, all known Bornean species are represented in the collection of *Odonata* made for me by Mr. COOMANS DE RUITER, and all of these were taken in the hill-country around Singkawang. These species are *M. parallelogramma albardae* SELYS, *M. decemlineatus* SELYS, and *M. quadratus* SELYS.

The male of the above described *M. phalantus*, though undoubtedly nearly related to *parall. albardae*, differs very markedly from that species by its much smaller size, and by the curious shape of its upper anal appendages. It is further distinguished by the shorter discoidal triangle of the front wing, by the narrower and almost parallel-sided yellow bands on each side of the thorax, and by the more widely separated and more obliquely placed antehumeral thoracic stripes. The shape of the inner branch of the sup. anal apps. of the male rather suggests *M. borikhanensis* FRASER, from the Laos country (Journ. Siam Soc. Nat. Hist. 9, 1933, p. 136-139, fig. 8, apps. ♂). Among other characters this species is well distinguished from *phalantus* by its superior size, and by the interrupted yellow band on the dorsal surface of the frons.

The female of our new species is easily separated from *parall. albardae* by the bifid median prominency on the occipital plate.

The three species have the following measurements:

M. borikhanensis (Laos): ♂ abd. + abd. 57, hw. 40 mm.

M. parall. albardae (W. Borneo): — 49-50, hw. 42 mm.

M. phalantus (W. Borneo): — 40.5-41, hw. 33-34.5 mm.

***Acrogomphus walshi*, sp.n. (fig. 13-15).**

Material examined: — 1 ♂ (ad.), S. Sumatra, Benkoelen residency, Moeara Tenam, ca 250 m alt., June 16-23, 1925, M. E. WALSH leg.

Male. — Labium greenish-yellow. Base of mandibles, labrum and anteclypeus green. Basal third of the labrum reddish-brown, this colour ill-limited anteriorly; distal margin finely black. Genae greenish-brown. Postclypeus, vertical portion of frons and vertex reddish-brown; upper surface of frons bright greenish-yellow, with an indistinct reddish-brown stripe along base. Vertex low, each of the lateral ocelli placed upon a low tubercle whose margins are distinctly raised. The occipital quadrangle bears a minute median tubercle, the blackish hind-border of which is a little swollen.

Prothorax warm reddish-brown above, paler alongside. Ground-colour of synthorax warm purplish-brown with clear yellowish-green markings, as shown in fig. 13. Antehumeral bands widened ventrad, narrowly separated from one another.

Legs very short; femora swollen, widest on middle. Femora ochreous, exterior surfaces with a thick black stripe, knees also darkened; tibiae and tarsi black.

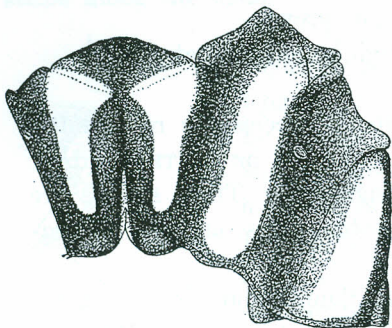


Fig. 13. — *Acrogomphus walshi*, sp. n. ♂ S. Sumatra. Colour-pattern diagram of synthorax.

Wings almost hyaline, membrane palest yellow only in the costal and cubital spaces of the proximal half of both wings. Pterostigma dark sepia-brown, braced, covering 5-6 cells. Neuration very similar to *A. malayanus*. Two rows of cells in the discoidal field of front wing to a level beyond the nodus. In left front wing however, there are 2 cross-veins, and in the right one 1 such a vein, in the proximal third of the discoidal field, running directly from M_4 to Cu_1 . Discoidal field of hind wing also with 1-3 of such simple connecting-veins in the proximal third. Nodal index $\frac{11\ 17.17.11}{10\ 13\ 13.11}$. Cross-nerves between M_{1+3} and M_4 $\frac{4.5}{3.3}$. Basal half of hind wing broader than in *malayanus*; anal loop one- or two-celled (left and right side); three rows of cells between Cu_2 and the wing-margin. Anal triangle exactly as in LAIDLAW's photograph of the wings of *malayanus*.

Abdomen very slender; proximal segments somewhat widened in both dimensions; lateral margins of 8th and 9th segments distinctly exfoliated, these segments rather much widened in both dimensions. Colouring brownish-black. Dorsum of segm. 1-2 largely yellow, the marking on the back of 2 constricted behind middle; sides, including the auricles, also yellow anteriorly. Basal four-fifth of segm. 3 with a dorso-lateral ochreous marking, which is finely interrupted on middle by the transverse carina, the basal portion being divided into two by the black longitudinal carina. Segm. 4 with these spots similar but smaller; 5 and 6 with paired dorso-lateral spots occupying only the basal fourth of each segment. Segm. 7 with a large yellow mark, divided into two portions by a fine mid-dorsal line of black, and occupying slightly less than the basal half of the segment. Sides of 8 and 9 each with anterior and posterior marginal spots, the latter extending upwards and bordering the hind margin. Segm. 10 black.

Anal appendages black, shaped as in the sketch.

Genitalia of segm. 2: hamulus small and slender; vesicle of penis moderately large, broadly ovate, more projecting than the hamule.

Length: abd. + app. 32, hw. 28.5, pt. 3 mm.

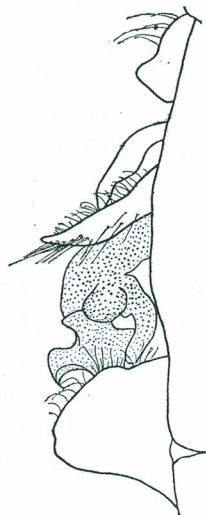


Fig. 14. — *Acrogomphus walshi*, sp. n. ♂ S. Sumatra. Genitalia of segm. 2, left side view; penile organ extruded (dotted).

I have much pleasure in naming this new species for Mrs. M. E. WALSH, the well-known lepidopterist of Soekaboemi, who has contributed largely to our knowledge of the Malaysian insect-fauna.

The species of *Acrogomphus* already known are few in number and mostly described from few individuals:

1. — *A. fraseri* LAIDLAW (Proc. Zool. Soc. London, 1925, p. 441 - 443) was described from South India; both sexes are known. Among other characters the male differs from the other species by its larger size (abd. 43.5 - 44, hw. 38 - 38.5 mm). The antehumeral thoracic stripes are small, wedge-shaped and incomplete above and below. Segm. 3 - 6 of the abdomen are black with small apical dorso-lateral spots of yellow. The vein Cu_2 in front wing markedly pectinate, having several distinct branches; the anal triangle is 4-celled.

2. — *A. malayanus* LAIDLAW (P.Z.S., loc. cit. p. 443 - 444, fig. 1 (wing) was described from Pulau Aor, off the E. Coast of Johore, Malay Peninsula. Only the type male is known. It is much smaller than *fraseri* (abd. 33.5, hw. 29 mm), but the thoracic markings are very similar to that species. The yellow spots on the abdomen are more extensive. The neuration of the wings very different from that of *fraseri*.

3. — *A. walshi*, of this paper, is from Sumatra, and differs from all other species by the broad, complete antehumeral bands of the thorax, which are confluent with the mesothoracic collar. It is of about the same size as *malayanus*, but, in addition to the venational characters, *walshi* differs from that species in the much more extensive yellow markings of the abdomen.

4. — *A. minor* LAIDLAW (Journal F.M.S. Museums, 16, 1931, p. 215 - 217) is from Selangor and Peninsular Siam. The male measures: abd. + app. 35, hw. 25 mm. According to LAIDLAW this is probably only a subspecies of *Onychogomphus circularis* (SELYS), from Nepal and North India. This species is entirely different from the preceding ones by the curious shape of the male's upper anal appendages, whose apices are abruptly curved downwards. On the back of the synthorax there is a pair of oblique antehumeral bands, incomplete above and below, and to the outside of these, on either side, a small, linear, humeral mark of yellow.

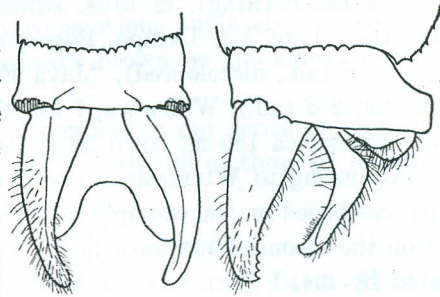


Fig. 15. — *Acrogomphus walshi* sp. n. ♂ S. Sumatra. Anal appendages, dorsal view and right side.

Megalogomphus icterops (MARTIN).

Chief references:

1902. MARTIN, Bull. Mus. d'hist. Nat. p. 506. — ♂ Java (*Heterogomphus*).
 1904. MARTIN, Mission Pavie, p. 9 sep. — ♂ Java (*Heterogomphus*).
 1907. WILLIAMSON, Proc. U. S. Nat. Mus. 23, p. 318, diagn. (*Heterogomphus*).
 1914. LAIDLAW, Proc. Zool. Soc. London, p. 57 - 58, pl. 1 f. 3 (insect). — ♂ Sarawak (*H. ict. borneensis*).

1922. LAIDLAW, Rec. Ind. Mus. 24, p. 413. — Java, Borneo (*Heterogomphus*).
 1934. SCHMIDT, Arch. Hydrobiol. Suppl. 13, p. 376 (key), 377, fig. 89, 91 & 92 (♀ structures). — ♀ Java (allotype).
 1934. LIEFTINCK, Treubia, 14, p. 438, 461, notes. — ♂ Java, Borneo.

Material examined: — 1 ♂ (ad., colours faded), Borneo: "Sarawak" (SELYS's handwriting), in Mus. Brussels. — 1 ♂ (ad.), S. Sumatra, Palembang res., ft. of Mt. Dempo, Pageralam, 700 m, May 23, 1935, M. E. WALSH leg. — 1 ♂ (ad., discoloured), "Java Fr. (UHSTORFER)" (SELYS's hand), in Mus. Brussels; 2 ♂ (ad.), W. Java, 7 km W. of Djasinga, Tjibeureum & Tjibarang-bang Rivers, ca 150 m, April 28 & 30, 1935, L. J. TOXOPEUS & AUTHOR leg.

According to WILLIAMSON and LAIDLAW, MARTIN's brief description of the type was based on the example in DE SELYS's collection in the Brussels Museum, not on the second ♂ specimen in the Paris Museum, as was perhaps erroneously stated by me. I have now confronted this typical example with a male from Sarawak in the same collection, identified by DE SELYS as *icterops*, and I have failed to discover any appreciable differences between these two males, which are of the same size and colouring.

LAIDLAW's ♂ from Matang Rd., in Sarawak, is doubtlessly an aberrant specimen, whose wing-neuration, according also to LAIDLAW, would seem to have undergone considerable artificial modification during development. Our specimen from Sarawak does not show any such irregularities in the venation, and, moreover, is so similar to our specimens of Java and Sumatra, that I would suggest to withdraw the subspecies-name *borneensis*, proposed by LAIDLAW for the Bornean form of *icterops*.

Like the other Museum-specimens, the colours of the ♂ from Sarawak, which is fully mature, have lost their freshness and are faded dirty yellowish. The wings of this ♂ are irregularly cloudy-yellow all over the membrane. Neuration as in the Javan type: *pt* braced, ochreous between black nervures. All *t*, *ti* and *ht* free. Only one *Cux* in all wings. Anal loop 2-celled. Anal triangle 4-celled (incl. one small marginal cell half-way its length). Nodal index $\frac{11.16.17.12}{11.12.13.12}$ Otherwise agreeing in all respects with LAIDLAW's description. [A slight error has crept in this author's statement of body-measurements: for "abdomen without appendages 51 mm", read: "with appendages"].

The living male of *M. icterops* is a very handsomely coloured insect; all pale markings, including the entire anterior surface of the head, are of a bright apple-green; this colouring strongly contrasts with the deep reddish-brown bands of the thorax and most of the abdominal segments.

All of our specimens agree in having the mahogany-red, or chestnut-coloured humeral and metepisternal bands of the thorax wider than in the ♀, described by SCHMIDT; the humeral band does not occupy more than two-fifths of the width of each mesepisternite and the lateral fascia is also narrower ¹⁾. The

¹⁾ This difference is perhaps due to the thoracic segments in SCHMIDT's diagram of the thorax being somewhat disproportionately rendered; the mesothoracic spiracle is situated much nearer to the 2nd lateral suture.

dorsum and sides of abd.-segm. 1-3 are spotted and striped with green. The ground-colour of 4-6 is mahogany-red and each of these segments, besides bearing a fine, interrupted longitudinal pale line over their middle, is adorned with a diffuse yellow streak over the transverse carinae, the jet-black apical rings being rather unsharply limited anteriorly. The anterior three-fifths of the dorsum and sides of segm. 7 carries a very conspicuous apple-green mark; 8-9 are dark brown above, ferruginous or Sanford's brown on the sides; segm. 10 and appendages lighter brown.

The genitalia and anal appendages are identical in our series of specimens, the latter being very similar in form to SCHMIDT's fig. 90 of those of *M. sumatranus* (KRÜG.) (loc. cit. p. 376).

There are from $\frac{14-16}{10-13}$ antenodals, and $\frac{10-12}{10-12}$ postnodals.

Measurements: abd. + app. 46, hw. 43, pt. 4.8 (Sumatra); 47.5-51, 41.5-44, 4.5-4.8 (Java); 47.5, 43, 5 mm (Borneo).

Mrs. WALSH's find of this conspicuous Gomphid in the jungle of South Sumatra took place almost simultaneously with its re-discovery in Java, and both of these discoveries are of considerable interest. *H. icterops* was not previously known from Sumatra, the only species found there being *H. sumatranus* (KRÜGER), which occurs in Upper Langkat and near Soekaranda, in Deli (North East Sumatra).

Near Djasinga, about 30 miles West of Buitenzorg, we first noticed the occurrence of *icterops* at the end of the rainy season, over two deeply recessed streams, which flow slowly through secondary and recently cleared forest. In the wet season months these low-levelled streams are roaring rivers, but from the outset of the dry monsoon the watermark sinks considerably, and the beds are then seen to consist partly of slate-rock deposits which, at the shallow stretches of the river, are coloured bright green by the slithery substance of *Spirogyra* covering the rocks; the bed of other portions of the river is composed of coarse sand and gravel-banks. *H. icterops* was first noticed in April, 1935, the last individuals struggling into July. It was exceedingly scarce and localized to such points where the current was swift and rippling over a bed of pebbles. The males have a rapid flight, low over the water, and when skimming the green rocks, are all but invisible; this may partly account for so striking and beautiful insect not having been discovered before. The female was not observed and no larvae could as yet be found.

Other Gomphidae captured in the bed of the Tjibarangbang were *Ictinus decoratus* SEL., *Gomphidia javanica* FÖRST., *Macrogomphus parallelogramma* SEL., *Leptogomphus lansbergei* SEL., and *Mesogomphus reinwardti* (SEL.).