STUDIES OF THE FAUNA OF SURINAME
AND OTHER GUYANAS: No. 28.

SURINAM DRAGON-FLIES OF THE GENUS PROGOMPHUS

by

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Up to the present time our knowledge of the genus *Progomphus* in Surinam has been restricted to that of the three species described by JAMES G. NEEDHAM (Trans. Amer. Ent. Soc. *69*, p. 208–214, pl. 15 fig. 13–15). The three species were represented in the *Progomphus* material which NEEDHAM acquired from Dr. D. C. GEIJSKES in 1943 for examination and description. Two of them appeared to be new and were described from female specimens under the specific names *brachycnemis* and *geijskesi*. The third species, represented only by a single larval exuvia, could not positively be determined; it was provisionally referred to DE SELYS's *Progomphus polygonus* known from Venezuela.

Through the kindness of Dr. L. L. PECHUMAN, Department of Entomology, Comstock Hall, Ithaca, New York, I received for observation this original *Progomphus* material, now part of the collection of Cornell University, which consisted of:

1. The holotype female of *Progomphus brachycnemis* (Cornell Holotype No. 3071), the body in a vial with alcohol, the wings on a slide. It was labelled "Suriname River, Kabelstation, 25.IX.'38 (Geijskes)".

2. The wings (on a slide) of a teneral female specimen of *Progomphus brachycnemis* from "Gansedam Soela, Suriname River".

3. The left pair of wings, the right hind wing, a leg and a fragment of a leg (all on a slide) of a teneral male specimen of *Progomphus brachycnemis* from "Kabelstation, 25.IX.1938".

4. A broken larval exuvia and four well-grown larvae of *Progomphus brachycnemis*, in a vial with alcohol, from "Suriname".

5. Eight well-grown larvae of *Progomphus brachycnemis*, in a vial with alcohol, from "Kabelstation, 28.IX.1938".

6. The holotype female of *Progomphus geijskesi* (Cornell Holotype No. 3072), the body in a vial with alcohol, the wings on a slide. The labels indicated that the dragon-fly was collected at the Paleumeu River by SCHMIDT on 20.VIII.1941.

7. A larval exuvia in a vial with alcohol with two labels: "Progomphus no 15 JGN, Suriname, Geijskes 50" and "Progomphus polygonus ??? Surinam. Kabelstation 21–28.IX.'38 Geijskes".

The specimens of *Progomphus* which I collected myself in Surinam were mainly secured at the seasonal and non-seasonal creeks of the Savannah Zone and a smaller collection was taken from the rivers and their tributaries further in the interior of the country. The specimens comprise a large number of adults, larval exuviae, larvae of various stages and reared specimens belonging to five different species; two of them new. It has also been my privilege to examine and to describe two new species from two different sources, one from the valuable collection of Dr. GEIJSKES (Paramaribo) and one from the Museum of Natural History at Leiden, Holland.

The descriptions and figures of the novelties described in the present account are listed under the following names:

Progomphus brachycnemis NEEDHAM – male.
Progomphus geijskesi NEEDHAM – male.
Progomphus pijpersi new species – male and female.
Progomphus conjectus new species – female.
Progomphus guyanensis new species – male, female and larva.
Progomphus approximatus new species – male, female and larva.

Progomphus brachycnemis Needham

Fig. 1–12, Pl. I

Progomphus brachycnemis NEEDHAM 1944, Trans. Amer. Ent. Soc. *69*, p. 208–211, pl. 15 figs. 13a–b (female and larva).

A fair number of males, females, larvae, larval exuviae and emerging and reared specimens have been assembled, which fit the

original diagnosis of the species *Progomphus brachycnemis* Needham. The specific reference has been further substantiated by comparison with the various specimens from Cornell University described under that name. The teneral holotype female was in a very poor condition. Wholly discoloured fragments of its body were found in the vial with alcohol, viz. the head, the left and, detached from them, the right series of legs with the appurtenant sclerites of the pterothorax, and the abdomen. Fortunately, the vulvar scale was well

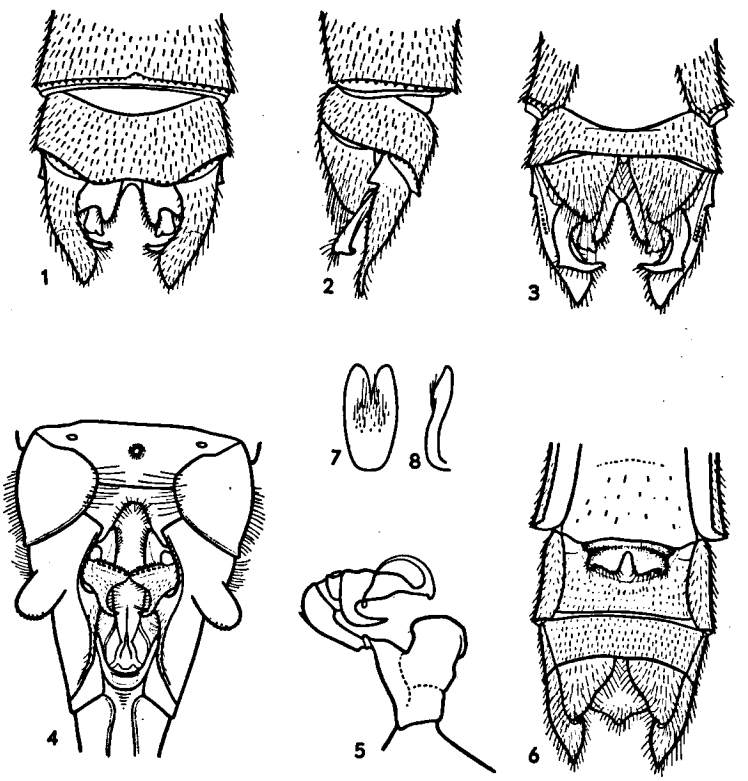
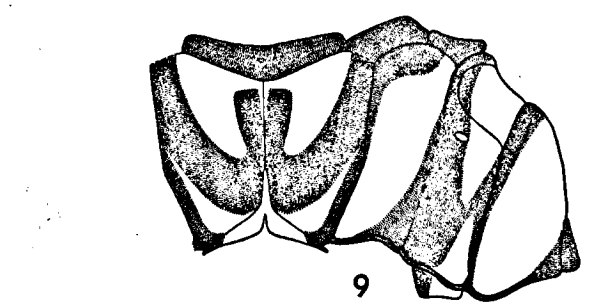


Fig. 1–8. *Progomphus brachycnemis* Needham from Suriname. — 1. Caudal appendages of allotype male, dorsal view. 2. The same, left lateral view. 3. The same, ventral view. 4. Genitalia of male, ventral view. 5. Penis, right lateral view. 6. Apical segments of female abdomen, ventral view, showing vulvar scale. 7. Tip of penis guard as seen from front (free-hand sketch). 8. The same, right lateral view (same).

preserved and, together with the wings on the slide, this provided adequate information for recognition.

The male of *Progomphus brachycnemis* is described below. A freshly killed, fully mature specimen was used for the description.

Male (allotype) – Total length 31.5 mm; length of abdomen 19



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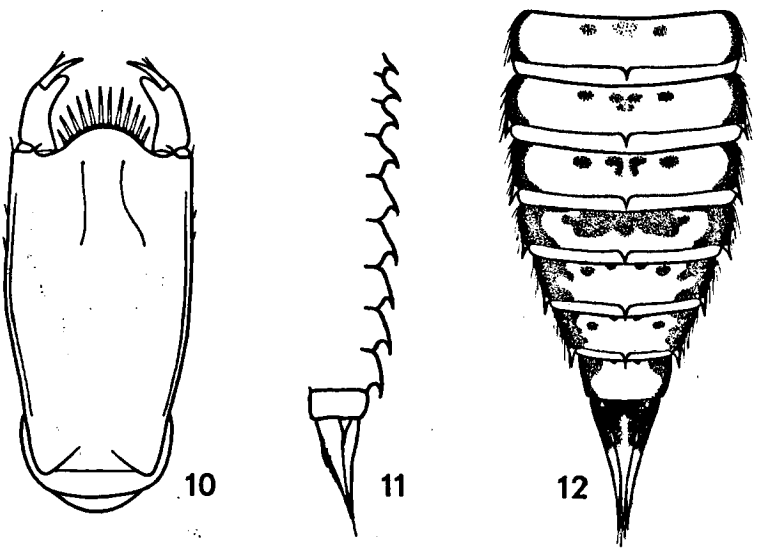

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Fig. 9–12. *Progomphus brachycnemis* Needham from Suriname. — 9. Diagram of pterothorax pattern of allotype male. 10. Labium of the larva. 11. Skyline of abdomen and caudal appendages of larval exuvia, left lateral view. 12. Colour pattern of abdomen of larval exuvia, dorsal view.

mm (caudal appendages included); length of hind wing 18 mm; costal edge of pterostigma of front wing 2.3 mm.

Face brown but genae, upper part of anteclypeus and antero-superior surface of frons bluish-green. Compound eyes grey-green. Ocelli brown. Vertex and rear of head very dark brown. Antenna dark brown but scape, pedicel and first distalia with yellow upperedges.

Prothorax brown but the swollen, bilobed portion of the middle lobe yellow and the posterior border of the hind lobe black.

The colour scheme of the pterothorax is in brown and light green; the lateral stripes are chalky-white green. Its pattern is as described for the holotype female and it is shaped as shown in diagram 9.

Legs brown but inner sides of first pair of femora and basal two-thirds of third pair of femora yellowish.

Abdomen dark brown but sides of segment 1, sides of segment 2 including auricles, basal half of dorsum of segment 2 and basal two-fifths of segment 7 yellow. There is a small, baso-middorsal, yellow spot on each of the segments 3 to 6; the spots diminish in size successively towards the rear. There is furthermore a fine, middorsal longitudinal yellow line on the segments 3 to 7. (The yellow spots on the abdomen, especially the ones on segments 6 and 7, are in young or fairly young specimens more or less chalky-white). Anal appendages brown but apical half of superior surface of superior appendages whitish mixed with green.

Wing membrane clear (in older specimens, slightly brown-tinged). Venation dark brown. Pterostigma brown, covering three underlying cells. Antenodal and postnodal cross veins of first series 10:12–12:9/9:9–9:10 in front and hind wings respectively. The first and fifth antenodal cross veins thicker. Intermedian cross veins 5–5/3–3 in front and hind wings respectively. Anal field of right front wing proximal to the triangle with a doubled cell, that of the left front wing is two cells wide for a distance of two cells. Hind wing with four paranal cells and three postanal cells. In the hind wing the first anal interspace (between veins A1 and A2) starts with a single cell against the subtriangle; the second anal interspace (between the veins A2 and A3) starts anteriorly with two rows of cells; both interspaces are about equal in width. Male triangle in anal angle of hind wing three-celled.

Abdomen expanded at basal segments 1 and 2, from near the base of 3 to half way along 7 narrow and cylindrical, thence widening to segment 10; the ultimate segment definitely depressed, its tergite markedly flattened above. The relative middorsal length of the last three abdominal segments is as 15:10:6, with the anal appendages 10 on the same scale. There is a conspicuous, well-developed, tooth-like tubercle on the centre of the venter of abdominal segment 1. The genitalia and anal appendages are shaped as shown in the above figures. The upturned tip of the penis guard is divided by a deep, V-shaped, central notch, the edges of which are rounded. Third segment of penis with a very large, baso-dorsal, strongly recurved tooth. Superior anal appendages (1.5 mm) blade-like, pointed apically, the lower margin curving to the tips in lateral view, the basal externo-lateral dilatation of each superior appendage acute at apex, the inferior margin with a single row of 7 denticles, the carina extending to last denticle. The branches of the inferior anal appendage bear the usual external upturned tooth at three-fifths of the length; the apical two-fifths is strongly incurved and upcurved, its extreme apex margined with two or three minute denticles.

Allotype male: SURINAME, Upper Para River, 25.III.1962. – In author's collection.

SURINAME, Corantijn River, 1.XI.1956, 1 ♀; Corantijn River (Kabalebo), 1.IX.1963, 2 ♀♀ (emerging); Coppename River (Raleigh Falls), 22.IX.1961, 1 ♀ (teneral); Upper Para River, 4.X.1959, 1 ♂ (emerging); 10.X.1959, 1 ♀ (teneral); 10.I.1960, 1 ♀; 4.III.1962, 1 ♂; 25.III.1962, 1 ♂, 2 ♀♀, 2 ♂♂ (emerging); 7.IV.1963, 1 ♂ (bred from ult. larva collected on 25.III.1962); 8.IV.1962, 2 ♂♂, 1 ♀, 1 ♂ (emerging); 17.IV.1962, 1 ♀; 23.IV.1962, 1 ♂, 1 ♀; 4.IX.1962, 5 ♀♀; 8.IX.1962, 1 ♂, 2 ♀♀, 1 ♀ (emerging); 17.X.1962, 1 ♀, 1 ♂ (teneral); 21.X.1962, 1 ♀ (emerging); 25 larval exuviae from Coppename River, Litani River, Tapanahoni River and Upper Para River, all the year round. One male and one female have been deposited in the Cornell University collection.

Of the adults, but one female has a single row of (paranal) cells behind the anal vein proximal to the triangle in the two front wings (as in the holotype) and one female in one front wing only; in all the other females and males there are two rows of cells, one to three cells long, behind the anal vein of the front wing proximal to the triangle. In the hind wings of the females and of the males the row of postanal cells does not start at the hind angle of the triangle in more than half the cases. Finally, all triangles and subtriangles were found to be two-celled, except in two front wings and three hind wings (4.5%) in which the subtriangle is three-celled.

At the Upper Para River (near the junction with the Saramacca Creek) I had the opportunity to study the habits of this species. The males and females generally rest on the leaves of the branches which overhang the creek. But in sunny weather at midday they come down to fly a short time above the water, thereby giving the collector the opportunity to secure them. However, the flight is swift and so very close above the surface of the water that this is still a difficult task. After these flights the females generally hover for a short time and then, at once, they disappear into the woods. The males do not hover. Emerging specimens were found at midday resting on bare patches of sandy banks or climbing up plants but always close to the water's edge.

Larvae can be obtained by sifting loose sand taken from the submerged beds near the banks. They show a very strong tendency to burrow into the sand whenever they are exposed at the surface. In the long dry season (Aug. 1–Nov. 15) larval exuviae can be found sometimes in large numbers, on the sandy banks. The exact place of observation is illustrated by a photograph in the author's paper on the Agriogomphine dragon-flies (*Studies Fauna Surinam*, Vol. VIII, pl. 10).

Progomphus geijskesi Needham

Fig. 13–20, Pl. II

Progomphus geijskesi NEEDHAM 1944, Trans. Amer. Ent. Soc. *69*, p. 211–212, pl. 15 fig. 14.

In May 1959 I went on a collecting trip along the Suriname River and on arriving at the Aroesobanja Falls (now "Brokopondo Meer") I made a search for dragon-flies on the Julianaweg, a bush path laid out for Her Majesty Queen Juliana on the occasion of her visit in 1955. As the path wound close by the falls it gave me a unique opportunity to inspect the shore of this river during a long, delightful and interesting walk. While resting in the shadow of the trees which partly overhang the falls I suddenly saw about seven dragon-flies, restlessly flying in the sunshine near the bank and close above the swiftly flowing water. In spite of the difficult conditions I was able to secure two specimens. Both were males and obviously of the same kind. They fit NEEDHAM's description of the species *Progomphus geijskesi* fairly well.

This species was described from a single female collected at the Paleumeu River, a tributary of the Suriname River. The holotype female, borrowed from the Cornell University collection, was in very poor condition. The body, preserved in a vial with alcohol, was badly discoloured and broken into several parts. Fortunately the apical

segments of the abdomen with the anal appendages and the vulvar scale were well preserved (Fig. 20).

Clearly *Progomphus geijskesi* is a border-line member of the genus. The male caudal appendages are "aberrant" from those of the usual *Progomphus* male in having the superiors not strongly flattened beyond their bases but more or less round in cross section, the inferior surface slightly channelled for the entire length and the ends of the forcipate tips rather abruptly curved downwards in oblique direction. Furthermore, the superiors are longer than the penultimate abdominal segment; they lack the usual basal externo-lateral dilatation and the inferior carina with the row of denticles. The inferior appendage is very stout; it is deeply excised for three-fifths its length. The basal two-fifths projects obliquely downwards and towards the rear, and nearly abrupt, perpendicular to it, the strong branches extend upwards and to the rear to a point about two-thirds of the way along the superior appendages.

Male (allotype) – Total length 37.5 mm; length of abdomen 29 mm (caudal appendages included); length of hind wing 19.5 mm; costal edge of pterostigma of front wing 2.75 mm.

Face brown, but anteclypeus and antero-superior surface of frons green. Vertex and antennae very dark brown. Scapes and first distalia green round their upper margin. Compound eyes greenish. The post-ocellar bulging areas of the vertex tufted with long brown hairs. Occipital plate brown. Rear of head entirely black.

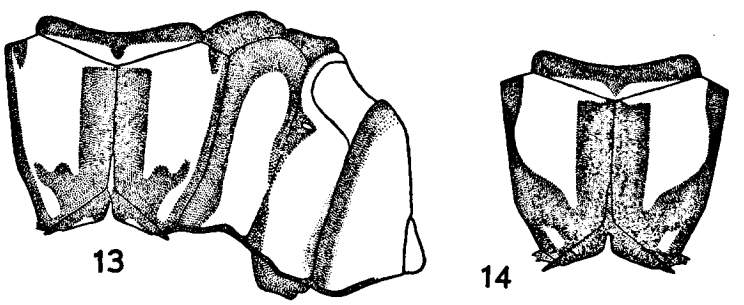


Fig. 13–14. *Progomphus geijskesi* Needham from Suriname. — 13. Diagram of pterothorax pattern of allotype male. 14. Diagram of dorsal side of pterothorax of paratype male, showing the inconstency of the colour pattern.

Prothorax dull brown. Each of the inflated areas of the middle lobe with green.

The colour scheme of the pterothorax is in chocolate brown and grass green. The thorax pattern is as described for the holotype female, but the green stripes on the sides are (in this fully mature male) not ill-defined but well-developed.

Legs brown, nearly black on tarsi and claws. Inner side of first

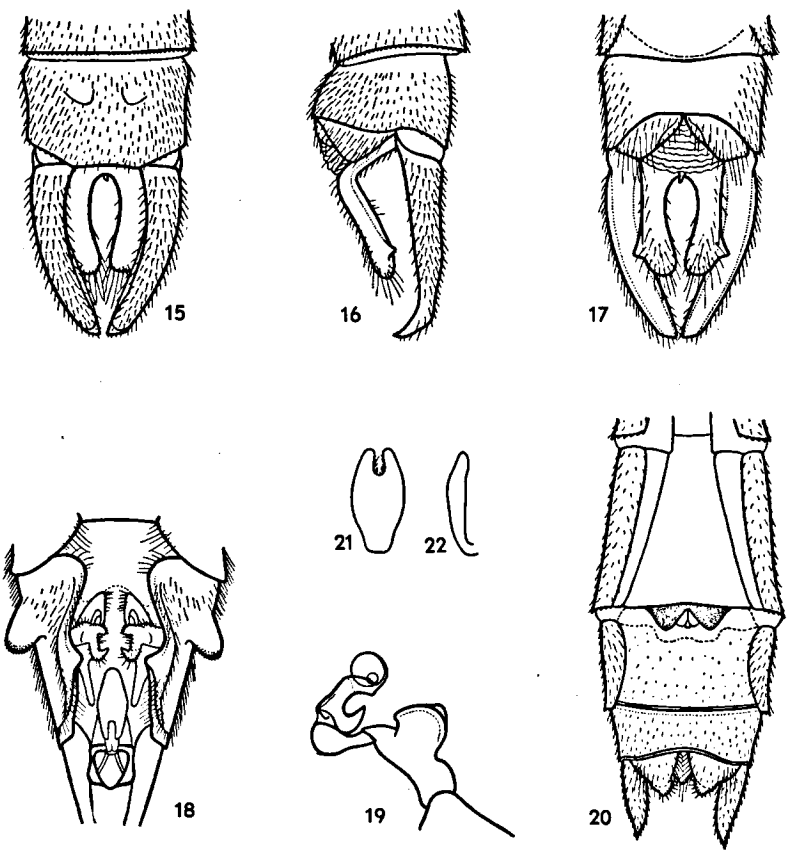


Fig. 15–20. *Progomphus geijskesi* Needham from Suriname. — 15. Caudal appendages of allotype male, dorsal view. 16. The same, left lateral view. 17. The same, ventral view. 18. Genitalia of male, ventral view. 19. Penis, right lateral view. 20. Apical segments of holotype female abdomen, ventral view, showing vulvar scale. 21. Tip of penis guard as seen from front (free-hand sketch). 22. The same, right lateral view (same).

femur greenish. Posterior tibia very long; it is one and a half times longer than the tarsus without the claws. Outer ridge of each of the posterior tibiae with ten spines.

Abdomen preponderantly dark brown. Segments 1 and 2 green below and on the sides. There is a middorsal green stripe on segment 2. Segment 3 with a baso-middorsal green stripe reaching to just beyond halfway along. Segments 4 to 7 with a small, baso-middorsal, subtriangular, green spot. These spots diminish in size successively on the segments 4, 5 and 6; the one on 7 being larger. Superior anal appendages dark brown, the extreme bases green. The inferior appendage nearly black. Anterior hamule dark brown. Posterior hamule brown, but lighter than the anterior hamule. Hind lobe dark, chocolate brown.

Wing membrane slightly brown-tinged. Venation dark brown. Pterostigma brown, covering $3\frac{1}{2}$–$4\frac{1}{2}$ underlying cells. Antendoal and postnodal cross veins of first series 7:13–13:8/8:9–9:9 in front and hind wings respectively. The first and fifth antenodal cross veins thicker. Intermedian cross veins 4–5/3–3 in front and hind wings respectively. Anal field of right front wing proximal to the triangle with one doubled cell; that of the left front wing is two cells wide for a distance of two cells. Hind wing with five paranal cells and two postanal cells, the anterior postanal cell enlarged. Frontal side of triangles not broken near outer end. In the hind wing the first anal interspace starts with one cell against the subtriangle, while the second anal interspace starts anteriorly with two rows of cells; the second anal interspace is much wider than the first. Male triangle in anal angle of hind wing three-celled.

Abdomen expanded at basal segments 1 and 2, from near the base of segment 3 to base of segment 7 narrow and cylindrical, thence widening on 7 to 9, the ultimate segment a little narrower and not noticeably depressed. The relative middorsal length of the last three abdominal segments is as 18:10:8, with the anal appendages 14 on the same scale. Venter of abdominal segment 1 with an anterior, transverse fold, densely covered with spine-like hairs. The base of the posterior hamule is moderately expanded. The upturned tip of the penis guard is deeply divided by a narrow, U-shaped, central notch; the outer edges of the notch are rounded. Third segment of penis with a stout, baso-dorsal, strongly recurved tooth.

Allotype male: SURINAME, Suriname River (Aroesobanja Falls), 27.V. 1959. – In author's collection. Second male with same data as allotype.

Of the other male the green markings on the frontal side of the pterothorax are less extended than in the allotype male. The anal field of the front wing proximal to the triangle possesses a single row of cells for its entire width. There are only two rows of cells behind vein Cu2 of the hind wing.

The larva is unknown.

Progomphus pijpersi nov. spec.

Fig. 23–28

When I had this paper in preliminary form and visited the Surinam Museum on March 17, 1964, Dr. D. C. GEIJSKES showed me four specimens (two males and two females) of an unknown species of *Progomphus*, which he had acquired from the expedition of the Wilhelmina mountain range. I gladly accepted his offer to describe it. The labels on the two envelopes, in which the specimens were preserved, indicated that the insects were collected by H. PIJPERS on August 5, 1963, at Kamp 3, Wilhelmina mountain range. The dragon-flies were found to be flying until 4 o'clock in the afternoon at a certain limited part of a shady creek.

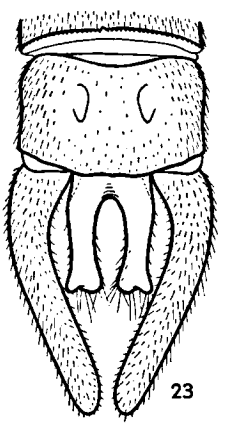
The species is very closely allied to *Progomphus geijskesi*. It is similar to it in stature and coloration. The male anal appendages are of the same type, but the superiors are much stouter and longer, the tips evenly and sharply curved downwards. The inferior appendage is a trifle shorter than that of *Progomphus geijskesi* and the arms reach backwards only to halfway along the exceedingly long superior appendages. There is a conspicuous, well-developed, nearly bean-shaped tubercle on the anterior fold of the venter of abdominal segment 1 which permits this species to be readily distinguished from *Progomphus geijskesi*.

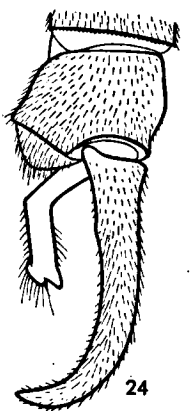
Male (holotype; abdomen broken into pieces) – Total length 37.5 mm; length of abdomen 29.5 mm (including caudal appendages 2.6 mm); length of hind wing 19.5 mm; costal edge of pterostigma of front wing 2.8 mm.

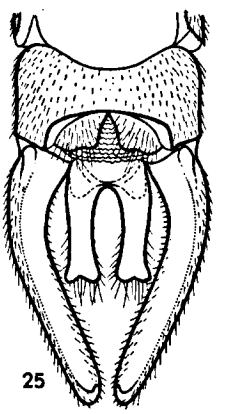
Coloration very similar to that of *Progomphus geijskesi*. Diagram

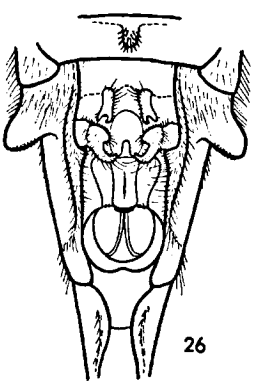
of pterothorax pattern shaped as shown in Fig. 28. It is most like that of the paratype male of *Progomphus geijskesi*, but a thin, faintly developed, pale humeral stripe is discernable, not connected with the dorsal juxta-humeral spot.

Posterior tibiae one and a third times longer than the tarsus









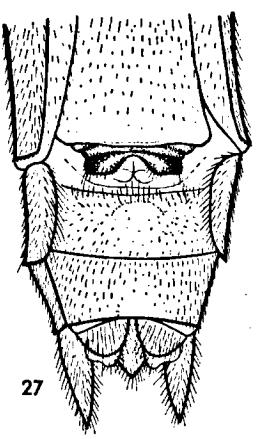


Fig. 23–27. *Progomphus pijpersi* nov. spec. from Suriname. — 23. Caudal appendages of holotype male, dorsal view. 24. The same, left lateral view. 25. The same, ventral view. 26. Genitalia of holotype male, ventral view. 27. Apical segments of allotype female abdomen, ventral view, showing vulvar scale.

without the claws. Outer ridge of each of the posterior tibiae with twelve spines.

The genitalia on abdominal segment 2 differ from those of *Progomphus geijskesi* in having the anterior hamules more slender, the posterior hamules more stoutly produced, the hind lobe (penial peduncle) much larger and inflated, and the U-shaped central notch at the tip of the penis guard wider and less deep.

The relative middorsal length of the last three abdominal segments is as 15:10:9, with the anal appendages 19 on the same scale.

Wing membrane slightly brown-tinged. Pterostigma brown, covering $4\frac{1}{2}$–$5\frac{1}{2}$ cells, with a distinct brace vein. Basal subcostal cross vein present. Antenodal and postnodal cross veins of first series 8:12–14:8/9:9–9:9 in front and hind wings respectively. First and fifth antenodal cross veins thicker, except in the right front wing, where it is so in the first and sixth antenodal cross veins. Intermedian cross veins 4–5/3–3 in front and hind wings respectively. One cubito-anal cross vein in each of the wings. Anal field of right front wing proximal to the triangle with a doubled cell, that of the left front wing with two rows of cells two cells long counting the anterior row, one cell long counting the posterior row. All triangles and subtriangles two-celled. Hind wing with five paranal cells and two postanal cells, the anterior postanal cell enlarged. Two rows of cells behind vein Cu2 of the hind wing, the cells of the anterior row enlarged. In the hind wing the first anal interspace starts with one cell against the subtriangle, the second anal interspace wider than the first and starting anteriorly with two cells. Male triangle in anal angle of hind wing made up of three cells.

Female (allotype; terminal segments of abdomen distorted) – Total length 36.5 mm; length of abdomen 27.5 mm; length of hind wing 21.5 mm; costal edge of pterostigma of front wing 3.4 mm.

Colouring very similar to that of the male. Posterior tibiae with 12 (left) and 13 (right) spines on the outer ridge. Abdomen stouter than in male. Sternal process of abdominal segment 1 shaped as in the male. Vulvar scale shaped as shown in the accompanying figure. The relative middorsal length of the last four abdominal segments is as 28:17:10:6, with the anal appendages, 8, on the same scale.

Wing membrane very slightly, brown-tinged. Pterostigma longer

than in male, covering 4–6 cells. Antenodal and postnodal cross veins of first series 9:13–14:9/10:9–9:8 in front and hind wings respectively. First and fifth antenodal cross veins thicker. Intermedian cross veins 5–5/4–3 in front and hind wings respectively. Anal field of right front wing proximal to the triangle with a doubled cell, that of the left front wing with two rows of cells two cells long counting the anterior row, three cells long counting the posterior row. Subtriangle of right hind wing one-celled, triangle of left hind wing three-celled, all the other triangles and subtriangles two-celled. Hind wing with five paranal cells and three postanal cells. There are three rows of cells behind vein Cu2 of the hind wing.

Holotype male and allotype female: SURINAME, Wilhelmina mountain range (Kamp 3), 5.VIII.1963 (collected by H. PIJPERS). — In collection of Dr. D. C. GEIJSKES.
Paratypes: With the same locality data as the holotype, 1 ♂ (in collection of author), 1 ♀ (in collection Geijskes); Wilhelmina moutain range (Kamp 2), 17.VII.1963, 1 ♀ (collected by S. LIGORIE), later found in the gomphine material of Dr. GEIJSKES. — In collection of author.

The venation of the wings is as for *Progomphus geijskesi* except that in *Progomphus pijpersi* the subtriangle of the hind wing is sometimes two-celled. In the five specimens before me the subtriangle of the hind wing is one-celled in half of the cases (50%); in the three specimens of *Progomphus geijskesi* which I have examined the subtriangle is one-celled in all hind wings (100%). There are three rows of cells behind vein Cu2 of the hind wing in all paratypes.

The larva is unknown.

Progomphus sp.

Fig. 29–31

Progomphus sp? No. 15, NEEDHAM 1944, Trans. Amer. Ent. Soc. *69*, p. 213–214, pl. 15 fig. 15a–b.

The larval exuvia described by NEEDHAM in his Neotropical Gomphine paper of 1944 under the heading "Progomphus sp? No. 15" was again obtained by myself. It is not identical with NEEDHAM's *Progomphus* larva No. 15 from Guatemala, described in his 1941 *Progomphus* life history paper (Trans. Amer. Ent. Soc. *67*, p. 237–238) and which specimen could be referred to his species *Progomphus williamsi* in 1943 (Bolet. Entom. Venezol. *2*, p. 202–204).

NEEDHAM suggested that the larval skin from Surinam might be that of *Progomphus polygonus*, a species described by EDM. DE SELYS (1879) from a single female from Mérida, Venezuela (CR Soc. Ent. Belg. *22*, p. 68). He justified this reference on the basis of the following facts: 1) The locality, Venezuela, is near enough to Surinam; 2) the exuvia is of suitable size, assuming that the dimension of 31 mm for

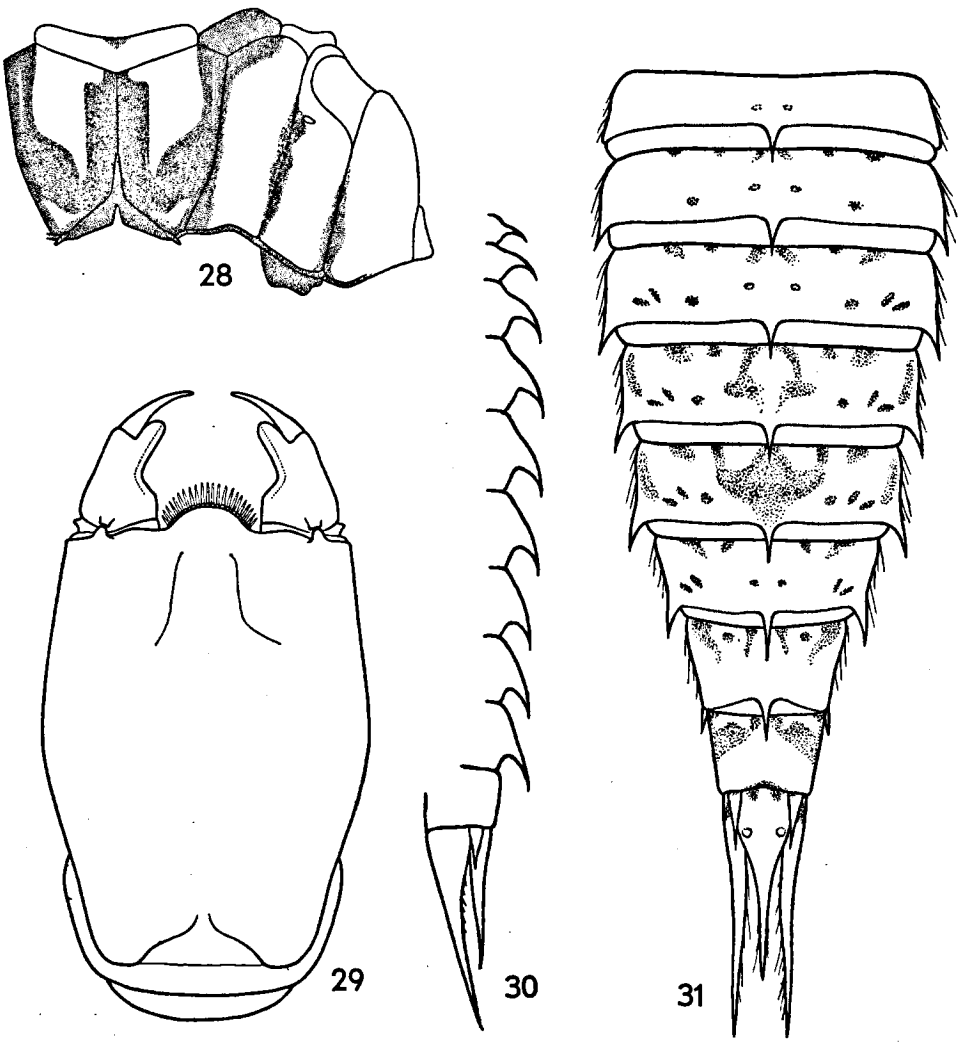


Fig. 28. *Progomphus pijpersi* nov. spec. — Diagram of pterothorax pattern of holotype male.

Fig. 29–31. *Progomphus* sp. No. 15 NEEDHAM 1944, from Suriname. — 29. Labium of the larval exuvia. 30. Skyline of abdomen and caudal appendages of the larval exuvia, left lateral view. 31. Colour pattern of abdomen of the larval exuvia, dorsal view.

the hind wing is correctly given in the original description. Although, Venezuela is near enough to Surinam, however the exact place of capture, Mérida, is in the western highlands of Venezuela and is remote, more than a thousand miles from Surinam proper. Such a wide range of geographical distribution is a question open to much doubt since other western, South American *Progomphus* species exhibit but little migratory tendency. But taking for granted NEEDHAM's supposition concerning the specific status of the larva, I made a search for the unique specimen of *Progomphus polygonus* which, as explicitly stated in the description of DE SELYS belonged to his own collection.

On my visit to the Institut Royal des Sciences Naturelles de Belgique at Brussels in 1961, Dr. GEORGES DEMOULIN, Sub-Director of the Department of Entomology, told me that the collection did not contain a species with that name, but allowed me the privilege of examining the material on hand placed under "Progomphus". I found it to be in a sad state of disarray. At least eight different species were recognized, one of which was represented by a single female specimen labelled "Prog. heterogonus S ♀" (doubtless in DE SELYS's handwriting). There was in addition a pin label "Merida", referring to its locality. The female fitted the original description of *Progomphus polygonus* and so an intriguing problem was solved. DE SELYS, after describing the female under the name *Progomphus polygonus*, did not alter the label which he had attached previously to the pin. The dimensions "Abdomen 31, aile inférieure 31" in the original description were correct. I myself measured the length of the abdomen as 30.5 mm and that of the hind wing 31 mm (see Bolet. Entom. Venezol. *2*, p. 205 footnote).

I am supplementing in this article DE SELYS's description of the holotype female of *Progomphus polygonus* with the following data which I have noted down for this specimen: Basal subcostal cross vein present. Antenodal and postnodal cross veins of first series 13:16–17:13/14:12–12:14 in front and hind wings respectively. In each of the front wings the cell between the first and second postnodal cross veins is doubled by a vein parallel to the costa. Front wings with two rows of cells behind the anal vein proximal to the triangle and behind vein Cu2. All triangles and subtriangles two-celled, except the subtriangle of the left front wing, which is three-celled; the dividing cross veins tri-radiate from the centre. The distal side of the triangle of the front wing is an angular line, first forming a re-entrant angle followed by a salient angle. The trigonal interspace of the front wing starts with three rows of cells for a distance of three cells. In each of the hind wings the paranal cells are five. In the right hind wing the postanal cells are five, in the left hind wing six. There are five rows of cells behind vein Cu2 of the hind wing. Thoracic dorsum with a pair of pale antehumeral stripes, reaching to anterior end of mesepisternum, the upper portions wedge-shaped and tapering. Vulvar scale short, its posterior margin evenly convex if viewed from beneath and with a deep, narrow, U-shaped, central notch.

> The larval exuvia, identical with NEEDHAM's *Progomphus* larva No. 15 from SURINAME and used for Fig. 29–31, was collected by the author at the Lawa River on 20.IX.1960. Its dimensions are: Total length 25 mm; length of abdomen 18 mm (including caudal appendages 4.4 mm); greatest width of same 5.5 mm; width of head over the eyes 4 mm; length of posterior femur 2.6 mm. It is in the author's collection.

Progomphus conjectus nov. spec.

Fig. 32, 44; Pl. IV

At Leiden in 1961 Dr. M. A. LIEFTINCK showed me the scanty *Progomphus* material in the Museum of Natural History. It contained a single female specimen from Surinam which apparently represented an undescribed species. The label attached to the pin indicated that the insect had been collected by H. A. BOON at Coppename River on October 10, 1901. In 1964 Dr. GEIJSKES visited Leiden and on his return to Surinam he kindly turned over to me for further study and description the female which I had superficially examined earlier. The dragon-fly was in fairly good condition. The tips of the wings were damaged. It is an old specimen, as can clearly be seen from the very brownish wing membrane. As it has an abdomen of 36 mm and a hind wing of 28 mm, it belongs to the rather large members of the genus. I have named this species *Progomphus conjectus* in view of its probable, specific identity with NEEDHAM's larva No. 15 discussed in the preceding pages; the female belongs to the only known, local *Progomphus* species of suitable size.

Female (holotype) – Total length 49 mm; length of abdomen 36 mm; length of hind wing 28 mm; distance on front wing from nodus to pterostigma 8.5 mm; costal edge of pterostigma of front wing 4 mm.

Face preponderantly green, but upper part of labrum, lower part of postclypeus and of frons (the last perhaps due to postmortem changes) brownish, and facial lobes yellowish along the free border. Antero-superior surface of frons broadly green, narrower at middle. Posterior half of frons and vertex brown, the concavity behind the post-ocellery ridges greenish. Occipital plate with a transverse band of green which is narrower at middle; the anterior and posterior parts of the occipital plate brown. Occipital posterior edge nearly straight, with a shallow, median incision. Occipital hairs short (0.3 mm). Scape, pedicel and first distalia brown with yellow upper edges; antenna pale at apex. Rear of head dark brown, but on the temporae along the eye border there is first a yellow spot and then a marginal band of yellow.

Prothorax brown, the middle lobe with yellow on lateral margins of the dorsum, the hind collar dark brown.

Pterothorax dark brown with well-developed, greenish-yellow stripes. Colour pattern shaped as shown in the accompanying figure. The pale mesothoracic "half-collar" narrowly interrupted on the median carina, the pale antehumeral stripe not connected with the mesothoracic "half-collar" and antealar sinus, the pale humeral stripe well-defined. The stripes on the sides of the pterothorax more or less parallel, the greenish-yellow stripes narrower than the brown stripes.

Legs brownish; the tibiae, tarsi and claws very dark brown, nearly black. First pair of femora greenish on the ventral sides. Posterior tibia about as long as the tarsus without the claws.

Wing membrane brownish. Venation dark brown including costa. Pterostigma brown, covering 7–8 underlying cells, with a strong

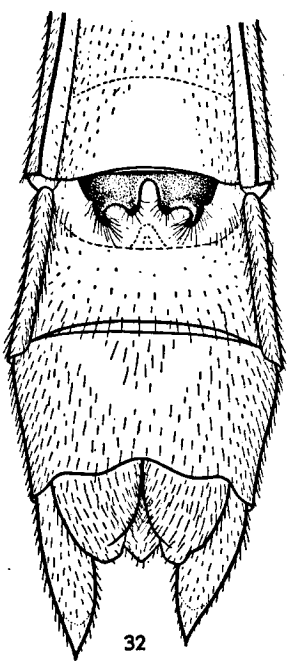


Fig. 32. *Progomphus conjectus* nov. spec. from Suriname. — Apical end of holotype female abdomen, ventral view, showing vulvar scale.

brace-vein. Antenodal and postnodal cross veins of first series 11:16–17:12/12:13–12:11 in front and hind wings respectively. First and fifth antenodal cross veins thicker. Intermedian cross veins 7–7/4–4 in front and hind wings respectively. A single cubito-anal cross vein in each of the wings. Triangles of front wings and of left hind wing three-celled, the dividing cross veins tri-radiate from the centre. Triangle of right hind wing two-celled. The triangles on the front wings are more or less equilateral, the distal side being slightly angled. Trigonal interspace of front wing starting with three cells against the triangle, followed by two rows of cells seven cells long in the left front wing, nine cells long in the right front wing. Anal field of the left front wing proximal to the triangle with two rows of cells for a distance of six cells, counting the anterior row, for a distance of seven cells counting the posterior row; that of the right front wing with two rows of cells for a distance of six cells counting the anterior or posterior row. Triangle of hind wing distinctly four-sided. The trigonal interspace of the hind wing starting with four cells against the triangle followed by two rows of cells four cells long. All subtriangles two-celled. Hind wing with six paranal cells. Postanal cells in left hind wing five, in right hind wing four. There are five to six rows of cells behind vein Cu2 of the hind wing.

Abdomen preponderantly dark brown with paler, greenish-yellow markings on the dorsum as follows: There is a narrow, longitudinal, middorsal stripe on segments 2 to 7. Segment 1 pale below. Segment 2 with the sides broadly pale. Segments 3 to 7 with basal, dorsolateral spots; the ones on 3 and 7 reaching to transverse carina; the ones on 4, 5 and 6 subtriangular; the ones on 5 and 6 connected on the anterior border of the segment. Segments 8 and 9 with pale markings against submedian ventral carinae. The submedian ventral carinae of the segments pale. Sterna of segments dark brown. Vulvar scale dark brown and shaped as shown in the Figure 32. There is a vestige of a tubercle on the anterior fold of the venter of segment 1. Segment 10 distinctly depressed. Anal appendages distally flattened and acutely pointed; they are dark brown, the tips pale-whitish. The relative length of the last four abdominal segments is as 28:16:10:8, with the caudal appendages 8 on the same scale.

Holotype female: SURINAME, Coppename River, 10.X.1901 (collected by H. A. BOON). — In the Museum of Natural History, Leiden, Holland.

Progomphus guyanensis nov. spec.

Fig. 33–43, 45; Pl. III

Of this species and the one next to be described I have many specimens in adult and larval stages, and several larvae have been reared by me. The two species are very closely allied; in size they fall within the median range of the genus.

Male (holotype) – Total length 40 mm; length of abdomen 30.5 mm (including caudal appendages 1.9 mm); length of hind wing 22.5 mm; costal edge of pterostigma of front wing 3 mm.

Face preponderantly dark brown, scantily covered with long brown hair. Postclypeus with postero-lateral green spots, the facial lobes with green borders. Posterior and middle part of anteclypeus green. Lateral margins of labrum green. Base of mandibles and genae green. The broad, green band on the antero-superior surface of the frons is constricted at middle (in other specimens sometimes interrupted). Compound eyes brown, somewhat greenish below. Vertex bare but projecting ridges behind the paired ocelli tufted with long brown hairs. Antennae nearly black, the upper edges of the scapes and first distalia green. Posterior side of scapes provided with brown hairs. Rear of head dark brown, but temporae with a green spot just below re-entrant angle of the eye border, followed by a marginal band of green. Occiput round above, with a posterior line of stiff, brown hairs to mark the place of the usual crest.

Prothorax dark brown, but the dorsum green on the posterior part of the first lobe and on the second lobe. Hind collar of prothorax dark brown.

Pterothorax dark brown with light green markings (lateral stripes white-green) as follows: Middorsal carina green; mesothoracic "half-collar" green, narrowly interrupted on the median carina; on the front of the pterothorax a pair of anteriorly diverging, oblong, green spots; no trace of a pale humeral stripe (in some specimens there is a trace of a pale humeral stripe near mid-length of the

humeral suture); a broad, mesepimeral, green stripe; metepisternum with a green spot near sub-alar carina and an ill-defined, green spot at the level of the spiracle (in some specimens a vestige of a metepisternal stripe is present); a broad, green stripe covering posterior half of metepimeron (Fig. 45 from dried specimen).

Femora brown, but ventral sides of first and second pair of femora green. Tibiae, tarsi and claws very dark brown, nearly black. Posterior tibiae somewhat longer than the tarsus without the claws. Knees (joints between femora and tibiae) with a white-greenish spot.

Abdomen preponderantly brown. Segment 1 with a middorsal, small, green spot. Segment 2 with a middorsal, green spot, which is widest at middle and which tapers towards the ends of the segment. Segments 3 to 7 with a middorsal, longitudinal, green line, that on three wider and tapering posteriorly, the ones on 4 to 7 very narrow. Superior part of auricles green. Segments 3 to 7 with distinct, basal dorso-lateral, subtriangular, green spots. Sides of posterior half of segment 7 and sides of segments 8 and 9 greenish. Submedian ventral carinae of segments 2 to 8 greenish. Anterior hamules dark brown. Posterior hamules greenish, the incurving acute points of the apical half dark brown. Hind lobe dark brown. Penis guard dark brown. Superior anal appendages brown, the distal half of the superior surface green (in younger specimens chalky-white, greenish). Inferior appendage dark brown. Secondary inferior appendages pale at the tips.

Wing membrane slightly brown-tinged. Venation dark brown, including costa. Pterostigma brown, covering 4½–5½ underlying cells, with a distinct brace-vein. Basal subcostal cross vein present. Antenodal and postnodal cross veins of first series 12:15–15:10/11:11–11:12 in front and hind wings respectively. First and fifth antenodal cross veins strengthened. Intermedian cross veins 6–5/4–3 in front and hind wings respectively. There is a single cubito-anal cross vein in all wings. All triangles and subtriangles two-celled. Two rows of cells in anal field of front wing proximal to the triangle. Two rows of cells in trigonal interspace of front wing. The two rows of cells in the trigonal interspace of the hind wing start with an extra initial cell against the triangle. Distal sides of triangles convex, forming a broken line. Eight (left) and seven (right) paranal cells in

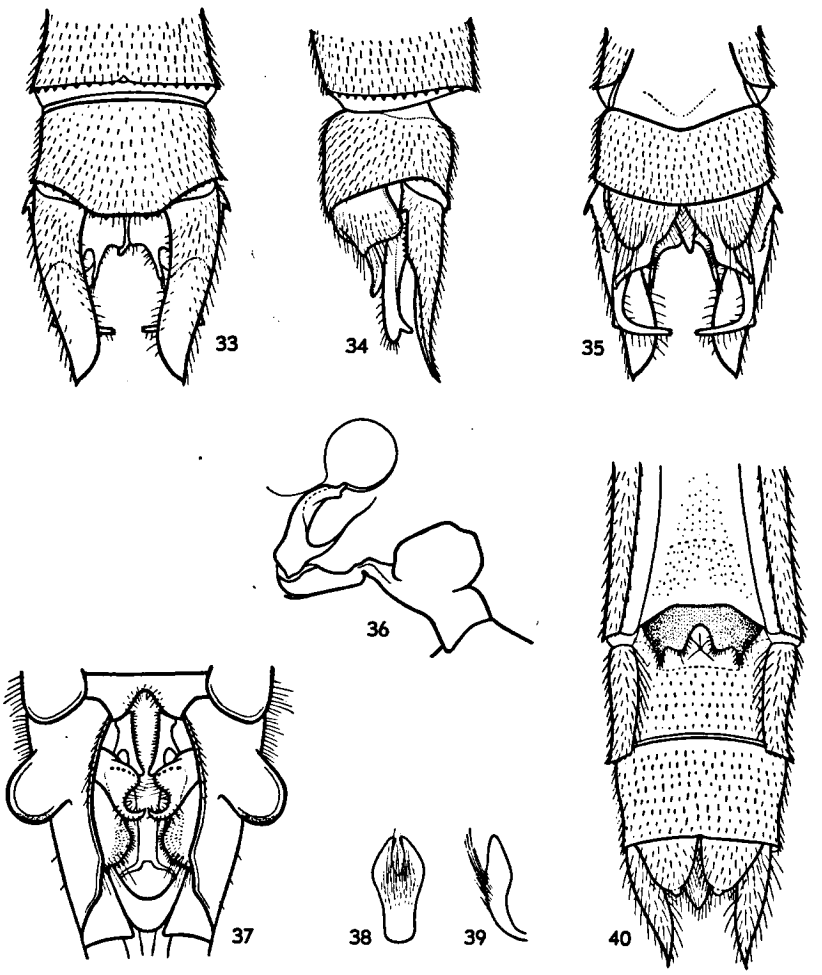


Fig. 33–40. *Progomphus guyanensis* nov. spec. from Suriname. — 33. Caudal appendages of holotype male, dorsal view. 34. The same, left lateral view. 35. The same, ventral view. 36. Penis, right lateral view. 37. Genitalia of male, ventral view. 38. Tip of penis guard as seen from front (free-hand sketch). 39. The same, right lateral view (same). 40. Apical end of allotype female abdomen, ventral view, showing vulvar scale (drawn when freshly killed).

front wings. Five paranal cells and three postanal cells in each hind wing. In the hind wing the first anal interspace is made up of two rows of cells from subtriangle to hind wing margin. It is anteriorly much wider than the second anal interspace, which starts with a full-width cell against the anal vein. Male triangle in anal angle of hind wing three-celled.

Abdomen with basal segments 1 and 2 expanded, from near the base of 3 to half of 7 narrow and cylindrical, thence slightly widening to 10, the ultimate segment somewhat depressed. The relative middorsal length of the last three abdominal segments is as 16:10:6, with the anal appendages 12 on the same scale. The anal appendages and genitalia of abdominal segment 2 are shaped as shown in Fig. 33–39. They bear a superficial resemblance to those of *Progomphus brachycnemis* although they are larger. The baso-inferior margin of the superior appendage with a single row of 7–9 denticles, the carina extending to the last denticle. The branches of the inferior anal

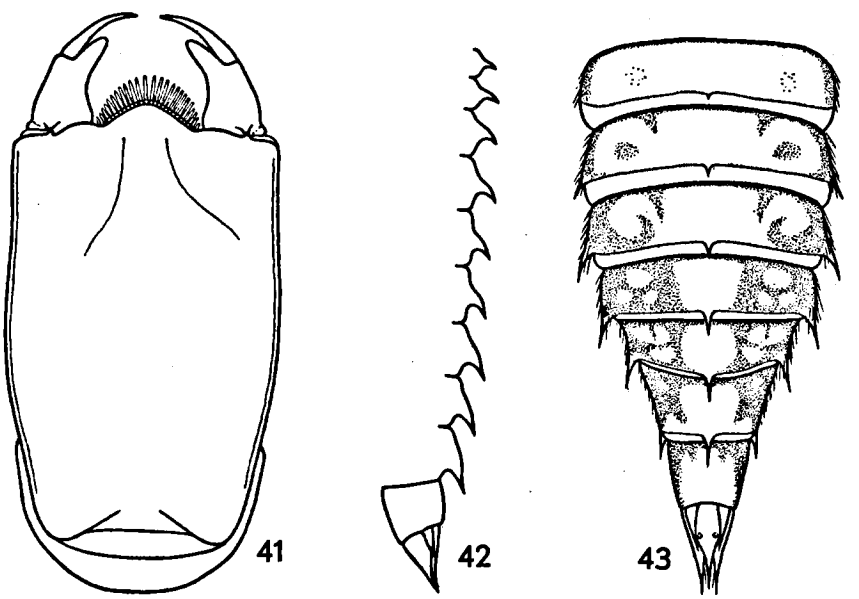


Fig. 41–43. *Progomphus guyanensis* nov. spec. — 41. Labium of the larval exuvia. 42. Skyline of abdomen and caudal appendages of the larval exuvia, left lateral view. 43. Colour pattern of abdomen of the larval exuvia, dorsal view.

appendage are slender and sharply curved inwards, the extreme apices margined with two or three minute denticles. The upturned tip of the penis guard is deeply divided by a U-shaped notch; the outer edges of the notch rounded. Venter of abdominal segment 1 with an anterior, transverse fold, the middle portion covered with very minute, stiff hairs.

Female (allotype) – Total length 39 mm; length of abdomen 29 mm; length of hind wing 25.5 mm; costal edge of pterostigma of front wing 3.3 mm.

Colouring in general similar to male but prothorax entirely brown, the green markings on the pterothorax less extended and the abdomen with larger green spaces. The basal dorso-lateral, subtriangular, green spots on the segments 2 to 7 long, the ones on segments 2 and 3 occupying the whole length of the segment, on the segments thereafter successively shorter, the one on segment 7 reaching the submedian vertical carina. The submedian ventral carinae and pleural membranes of segments 2 to 8 green; the sterna black, including the prolongations. The relative middorsal length of the last four abdominal segments is as 28:16:10:8, with the anal appendages 9 on the same scale. Sternal process of abdominal segment 1 as in holotype male.

Wing membrane clear (in more fully mature specimens, slightly, brown-tinged). Antenodal and postnodal cross veins of first series 9:16–15:10/10:11–11:11 in front and hind wings respectively. First and fifth antenodal cross veins thicker. Intermedian cross veins 6–7/4–4 in front and hind wings respectively. All triangles and subtriangles two-celled. Six paranal cells and three postanal cells in each of the hind wings.

Holotype male: SURINAME, Upper Coropina River (Dauwdropkamp, now "Zwemplaats Cola Kreek"), 26.XII.1959; allotype female: Suriname, Upper Para River, 30.IV.1963. — In author's collection.
Paratypes: SURINAME, Brokopondo, 21.V.1957, 1 ♀ (teneral); Upper Coropina River (Dauwdropkamp), 8.IX.1958, 1 ♀; 26.XII.1959, 3 ♂♂; 28.XII.1959, 1 ♀; 29.XII.1959, 6 ♂♂, 1 ♀; 30.XII.1959, 1 ♀; 3.I.1960, 1 ♂, 2 ♀♀; Upper Para River, 1.IV.1962, 1 ♂; Phedra, 20.I.1963, 1 ♀. Reared specimens: Phedra, 4.III.1962, 2 ♂♂, 2 ♀♀, emerged on 5.III.1962 (♀), 8.III.1962 (♂), 9.III.1962 (♂) and 17.III.1962 (♀); Troelinde Creek, 10.XI. 1962, 4 ♂♂, emerged on 13.XI.1962, 16.XI.1962, 20.XI.1962 and 21.XI.1962.

Progomphus approximatus nov. spec.

Fig. 46–50

This species is very similar in stature and coloration to *Progomphus guyanensis*, but there is a dorsal juxta-humeral spot of green always present although it is sometimes very small and vestigial, and the male abdomen has at the most a vestige of basal, dorsolateral, green spots on segments 3 to 7. The most striking morphological differences seem to be in the anal appendages of the male; the tip of the branches of the inferior appendage is stouter and it extends obliquely to the rear and inwards. The genitalia of the second abdominal segment, including penis and penis guard, bear a very considerable resemblance to those of *Progomphus guyanensis* and they do not offer any clear basis for the separation of the two species. There is a small tubercle on the anterior fold of the venter of abdominal segment 1, covered with minute, stiff hairs. I have found no differentiating character in the wing venation of this species and the preceding one.

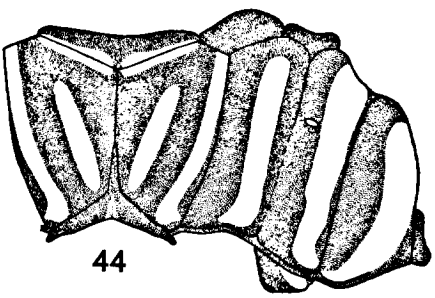
Male (holotype) – Total length 42 mm; length of abdomen 32.5 mm; length of hind wing 24 mm; costal edge pterostigma of front wing 3.2 mm.

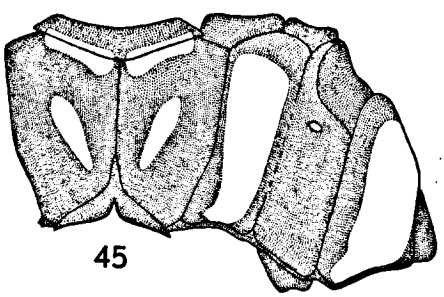
Wing membrane slightly brown-tinged. Basal subcostal crossvein present. Antenodal and postnodal cross veins of first series 10:14–15:11/12:11–11:12 in front and hind wings respectively. Intermedian cross veins 6–6/4–4 in front and hind wings respectively. Triangle in right front wing three-celled. Subtriangle in right hind wing one-celled. All the other triangles and subtriangles two-celled. Other venational characters as in holotype male of *Progomphus guyanensis*.

Female (allotype) – Total length 41.5 mm; length of abdomen 31.5 mm; length of hind wing 26.5 mm; costal edge of pterostigma of front wing 3.75 mm.

Wing membrane slightly brown-tinged. Antenodal and postnodal cross veins of first series 11:16–17:12/13:11–12:13 in front and hind wings respectively. Intermedian cross veins 6–7/4–4 in front and hind wings respectively. Triangle in both front wings three-celled.

All the other triangles and subtriangles two-celled. In each of the hind wings the postanal cells are four. Other venational features as in allotype female of *Progomphus guyanensis*.





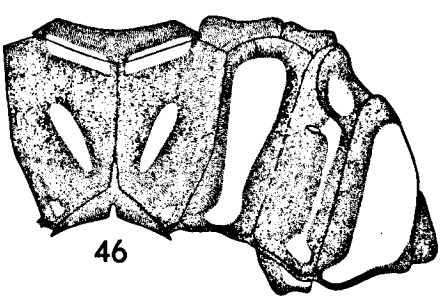


Fig. 44. *Progomphus conjectus* nov. spec. — Diagram of pterothorax pattern of holotype female.

Fig. 45. *Progomphus guyanensis* nov. spec. — Diagram of pterothorax pattern of holotype male.

Fig. 46. *Progomphus approximatus* nov. spec. — Diagram of pterothorax pattern of holotype male.

Holotype male: SURINAME, Mooi Wanna (Weyneweg), 3.I. 1964; allotype female: same locality, 4.I.1964. – In author's collection. Paratypes: SURINAME, Gansee, 5.X.1958, 1 ♂ (teneral); Mooi Wanna (Weyneweg), 3.I.1964, 2 ♂♂; 1.IV.1964, 1 ♂, 1 ♀; 2.IV.1964, 1 ♂ (teneral); 24.VII.1964, 1 ♀; 25.IX.1964, 1 ♂ (emerging), 1 ♀ (teneral). Reared specimens: Phedra, 4.III.1962, 2 ♂♂, emerged on 10.III.1962 and 11.III.1962.

The two species *Progomphus guyanensis* and *Progomphus approximatus* remain in the trees which overshadow the creeks. In clear weather at midday they come down. After flying to and fro, the females hover for a short time, whereas the males generally rest on the sandy banks or on the bare twigs of the lower vegetation. Occasionally one can see several males together, fluttering restlessly up and down in the sunshine and close above the water of the creek.

LARVA of PROGOMPHUS GUYANENSIS and PROGOMPHUS APPROXIMATUS.

Although I have reared the two species *Progomphus guyanensis* and *Progomphus approximatus* several times, I have found no distinct, differentiating character in either their larval structure or the colour pattern of the abdomen. This pattern is generally faintly developed; the exuviae are sometimes nearly without colour pattern and the extent of the dashes of brown in the deeply pigmented specimens is variable. The larva, described below from an exuvia of a reared male specimen, is that of *Progomphus guyanensis*. It is one of the specimens with the most complete development of the pigmentation pattern. The specimen was collected at Troelinde

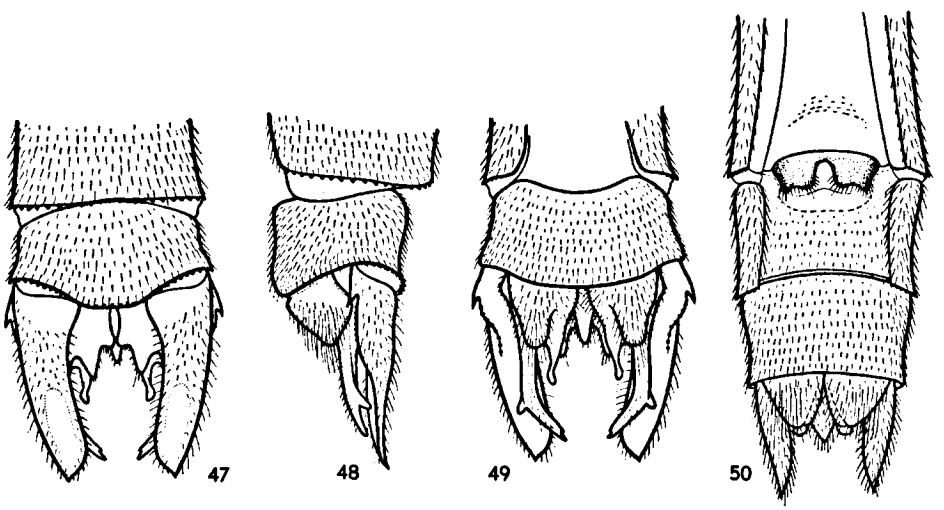


Fig. 47–50. *Progomphus approximatus* nov. spec. from Suriname. — 47. Caudal appendages of holotype male, dorsal view. 48. The same, left lateral view. 49. The same, ventral view. 50. Apical end of allotype female abdomen, ventral view, showing vulvar scale (drawn when freshly killed).

Creek near Zanderij on 10.XI.1962 and it transformed to the adult on 20.XI.1962. The larval skin is in the author's collection.

Total length 19 mm; length of abdomen 12 mm (including caudal appendages 1.6 mm); greatest width of same 4.6 mm; width of head over the eyes 3.4 mm; length of posterior femur 2.5 mm.

A clean, naked, torpedo-shaped larva, hairy on all lateral margins of head, thorax and abdomen, with powerful, hairy legs and a pointed abdomen.

Head slightly wider than pronotum, flat above, roughly triangular in outline, about as long as wide, in front covered with adpressed spine-like, brownish hairs, but labrum bare and convex on the middle line. Dorsal surface of head between and behind the paired ocelli covered with microscopic warts, occipital lobes rounded and fringed with brownish bristles. Antennae long, the basal two segments cylindrical, each with a ring of strong hairs; third antennal segment very long and about three times as long as the two basal segments combined, finger-shaped, flattened, densely clothed with brown bristles; the fourth segment is about a fourth the length of the third, slender, slightly curved, nearly devoid of bristles, and reflexed upward.

Labium shaped as shown in Fig. 41. It extends back to well beyond the procoxae. The mentum is about twice as long as wide and slightly narrowed toward its basal hinge. The median lobe is prominent, subtriangular, and margined with a regular row of about twenty, rather long, scales. The inner border of the lateral lobe is toothless and concave; the end of the lateral lobe bluntly rounded; movable hook about twice as long as the portion of the lateral lobe beyond the base of its movable hook, slender, with a slight increase in curvature before its tip nearly two-thirds along the length.

Prothorax broadly depressed; the disc shield-shaped and large, its hind margin on line with the bases of the posterior legs, covered with microscopic warts except for a pair of large, hairless crescents on the middle, antero-lateral portions with adpressed, spine-like hairs. Meso-metathorax scantily covered with microscopic warts on the projecting portions, side margins with longish, stiff hairs. Wing-sheaths strongly divergent to rearward, the tips reaching to well on to the fourth abdominal segment.

Legs short, very strong, resembling those of *Progomphus brachycnemis*, but first pair of femora unusually thick and strong, and tibiae of posterior pair of legs about as long as the tarsi they bear. There is no trace of burrowing hooks on the first two pairs of tibiae.

Abdomen smooth, lanceolate, subtriangular in cross section, but convex on the three sides, widest across segment 6, thence regularly tapering. Dorsal hooks present on segments 1 to 9; skyline shaped as shown in Fig. 42. The dorsal hooks are nearly equal in height and sharply pointed, successively more pointed to rearward in dorsal view and flattened laterally on segments 3 to 9; that on 1 narrow, those on 2 to 6 increasing in width if viewed sideways, on 7 to 9 suddenly wider, larger and more or less similar. There are lateral spines on the segments 5 to 9, the one on 9 smallest, the ones on 6, 7 and 8 about equal in size. The dorsal side of segment 10 is in length about three-fourths the length of the ventral side. The caudal appendages are a trifle shorter than segment 10 is long on the ventral side. The superior appendage is a trifle shorter than the inferior appendages; the tips of these appendages are slightly upturned. The lateral appendages are about half as long as the inferior appendages. There is a pair of round bosses on the superior appendage. Abdomen pale on segments 1 to 4; other segments brown-yellow with a faintly developed, brownish pattern which is shaped as shown in Fig. 43.

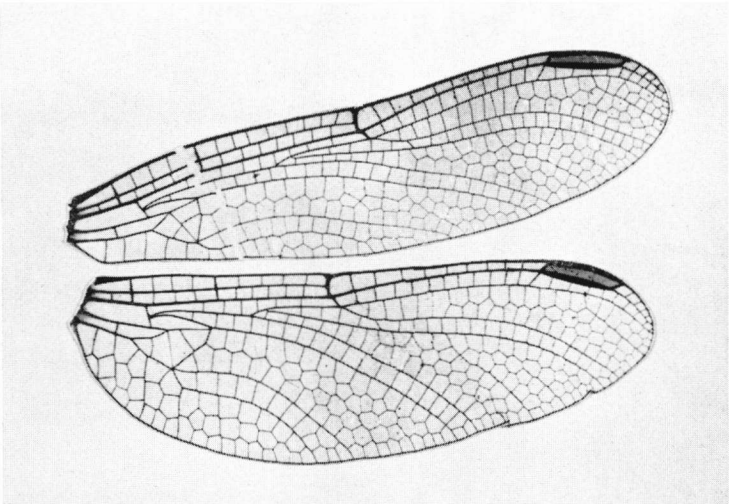


Plate Ia. *Progomphus brachycnemis* Needham. Right pair of wings of holotype female.

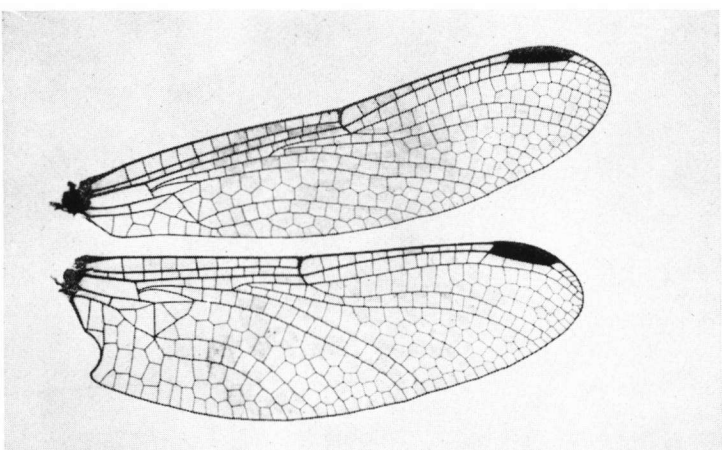


Plate Ib. *Progomphus brachycnemis* Needham. Right pair of wings of allotype male.

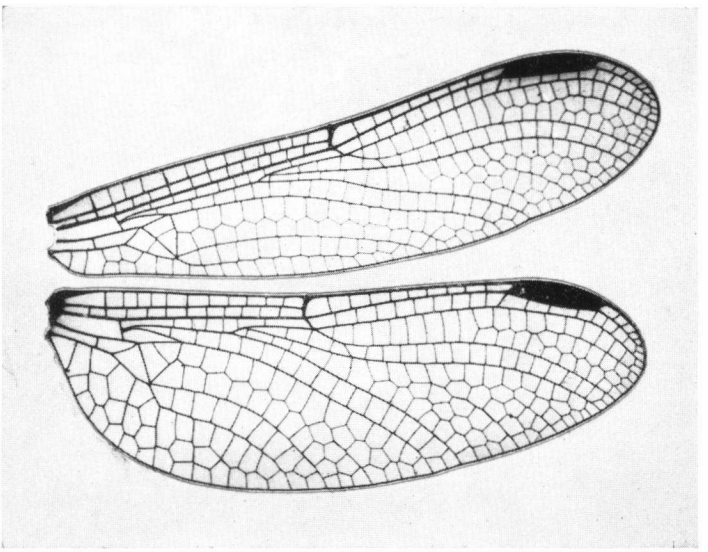


Plate IIa. *Progomphus geijskesi* Needham. Right pair of wings of holotype female.

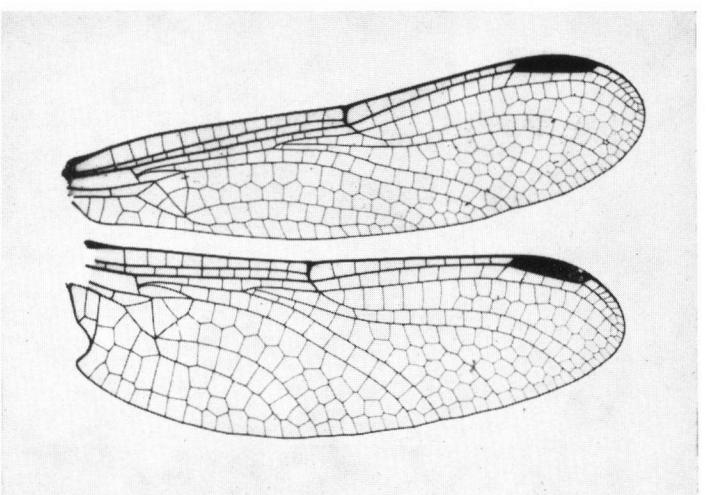


Plate IIb. *Progomphus geijskesi* Needham. Right pair of wings of allotype male.

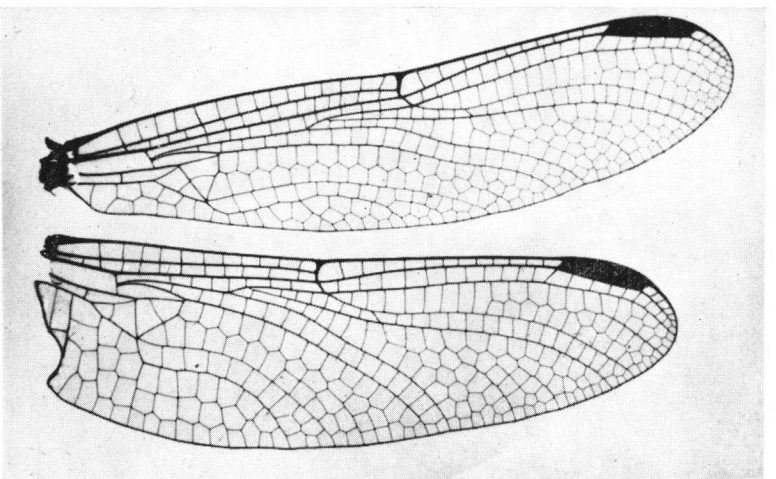


Plate IIIa. *Progomphus guyanensis* nov. spec. Right pair of wings of holotype male.

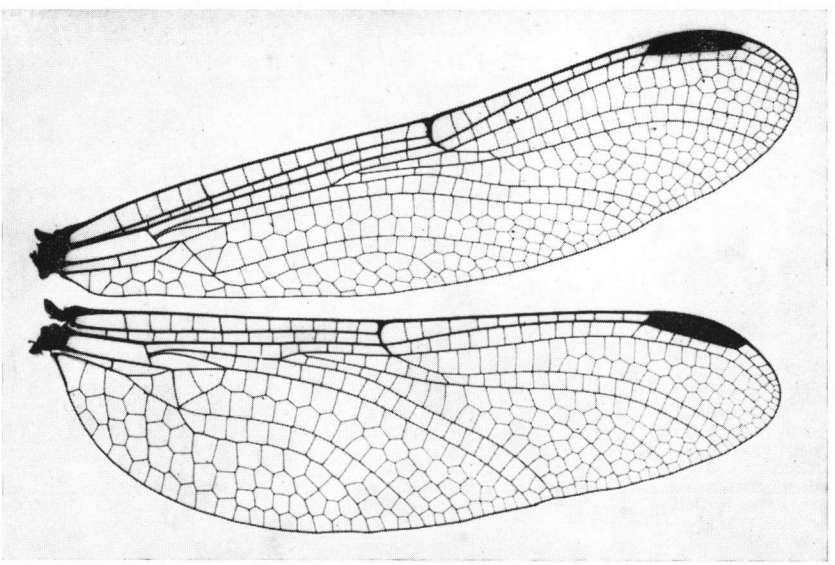


Plate IIIb. *Progomphus guyanensis* nov. spec. Right pair of wings of allotype female.

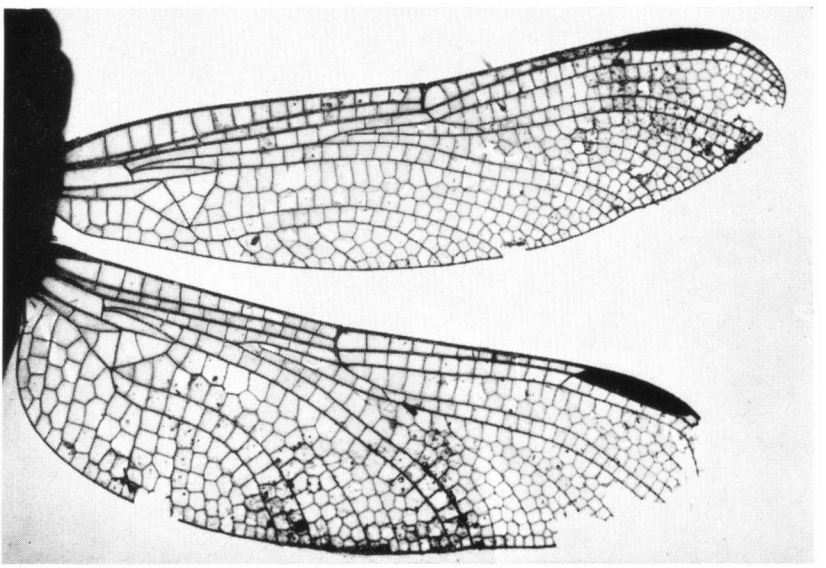


Plate IV. *Progomphus conjectus* nov. spec. Right pair of wings of holotype female.