STUDIES ON THE FAUNA OF SURINAM
AND OTHER GUIANAS: No. 29.

# SURINAM DRAGON-FLIES OF THE AGRIOGOMPHUS COMPLEX OF GENERA

by

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The so-called "Agriogomphus complex" contains a number of imperfectly known little Gomphine dragon-flies which fall within the *Epigomphus* series of the Legion *Gomphus* of DE SELYS as proposed by E. B. WILLIAMSON in his paper of 1920 (Occ. Pap. Mus. Zool. Univ. Mich. *80*, p. 8). The adult material hitherto recorded consists of only a dozen specimens. The group comprises four genera and the species known to us are chronologically listed below under their original names:

1. *Agriogomphus sylvicola* SELYS 1869, Bull. Acad. Belg. (2) *28*, p. 189.
2. *Cyanogomphus waltheri* SELYS 1873, Bull. Acad Belg. (2) *36*, p. 753.
3. *Cyanogomphus demerarae* SELYS 1894, Ann. Soc. Ent. Belg. *38*, p. 173.
4. *Cyanogomphus tumens* CALVERT 1905, Biol. Centr.-Amer., Neuropt., p. 169.
5. *Cyanogomphus conchinus* WILLIAMSON 1916, Ent. News *27*, p. 168.
6. *Ischnogomphus jessei* WILLIAMSON 1918, Occ. Pap. Mus. Zool. Univ. Mich. *52*, p. 10.
7. *Ebegomphus strumens* NEEDHAM 1944, Trans. Amer. Ent. Soc. *69*, p. 186.
8. *Cyanogomphus uncatus* FRASER 1947, Act. Zool. Lillo. *4*, p. 437.

It must be noted that the species mentioned under nos. 3, 4 and 5 were questionably referred to the genus *Cyanogomphus*. F. C. FRASER transferred *Ischnogomphus jessei* in 1943 to the genus *Agriogomphus* (Proc. Ent. Soc. Lond. B, *12*, p. 162). J. G. NEEDHAM transferred *Cyanogomphus conchinus* in 1944 to the genus *Ebegomphus* (Trans. Amer. Ent. Soc. *69*, p. 185). In the same paper (p. 180) he summarized the adult characters of the group. Further, he described the immature stages of three genera of the group, viz. *Cyanogomphus* in his paper of 1940 (Trans. Amer. Ent. Soc. *65*, p. 382) and both *Agriogomphus* and *Ebegomphus* in his additional paper of 1944 (Trans. Amer. Ent. *69*, p. 183, 190). In the latter paper (p. 180–181) he also characterized these stages on the basis of his knowledge of the larvae of the three genera, and concerning these characters he remarks: "These characteristics become progressively stronger in *Agriogomphus*, *Cyanogomphus* and *Strumagomphus* [=*Ebegomphus; Strumagomphus* is an error], and correspond, I think, to the specialization by reduction and readjustment seen in the wing venation of the adults".

This contribution to our knowledge of the Agriogomphines mainly concerns the adult and immature stages of the group obtained during my explorations in Surinam. About eighty Agriogomphine dragon-flies were collected, mostly on week-end trips and almost entirely from the creeks which run through the savannah zone in the surroundings of the airport at Zanderij. A new species of *Ischnogomphus* was discovered. A large number of males and many more females belonging to two *Ebegomphus* species were secured and I was enabled to derive the difference of sex in the wing venation of these species. Larval exuviae associated with these genera were taken from the banks of these creeks and Agriogomphine larvae of various stages were obtained by sifting leafy trash from the sandy or somewhat gravelly bottom. As a result it was possible to rear the larvae of *Agriogomphus sylvicola* (males and females).

In addition, a critical survey was made of the type specimens in the European and American musea, and the Agriogomphine material from Surinam previously brought together by Dr. D. C. GEIJSKES was examined as far as it could be traced in the Odonata

collection of Cornell University, Ithaca, New York. During my stay in Europe (1961) I took the opportunity of investigating the two type specimens (females) of *Agriogomphus sylvicola* Selys and the holotype male of *Cyanogomphus waltheri* Selys, which remained in EDM. DE SELYS's collection in the Institut Royal des Sciences Naturelles de Belgique in Brussels. The holotype male of *Cyanogomphus demerarae* Selys and the holotype female of *Cyanogomphus tumens* Calvert were examined on my visit to the British Museum (Natural History) in London. By the courtesy of Dr. IRVING J. CANTRALL (Museum of Zoology, Ann Arbor, Michigan) I was able to borrow the holotype males of *Cyanogomphus conchinus* Williamson and *Ischnogomphus jessei* Williamson. One of the two *Ebegomphus* species encountered in Surinam proved to be conspecific with the first mentioned specimen taken from adjoining British Guiana. I owe my sincerest thanks to Dr. L. L. PECHUMAN (Department of Entomology, Comstock Hall, Ithaca, New York) for making accessible the Surinam Agriogomphine material in the Cornell University collection, including the holotype male of *Ebegomphus strumens* Needham. This specimen was found to be identical with DE SELYS's *Cyanogomphus demerarae*. The latter species may be transferred to the genus *Ebegomphus*, as proposed by NEEDHAM. I am also indebted to Mr. D. E. KIMMINS for valuable data on some type specimens in the collection of the British Museum (Natural History).

I have not seen FRASER's holotype male of *Cyanogomphus uncatus* in the Instituto Miguel Lillo collection and his allotype male of *Agriogomphus sylvicola*, now in the collection of the British Museum (Natural History), London. The brief description of *Cyanogomphus uncatus* is insufficient to make possible the generic placement of the species although the male genitalia and anal appendages, as shown in the accompanying figures, resemble more closely those of *Cyanogomphus waltheri* than of any other Agriogomphine species.

The two *Ebegomphus* species are redescribed from Surinam specimens; the females are hitherto unknown. Illustrations are supplied of the wings and sexual organs of the males and females of all the Agriogomphine species found in Surinam, together with free-hand sketches of the vulvar scales (subgenital plates) of the female

type specimens of *Agriogomphus sylvicola* and *Cyanogomphus tumens*, now published for the first time. Drawings are given of the entire larval exuviae together with some larval structures of the genera *Agriogomphus*, *Ischnogomphus* (although by supposition only) and *Ebegomphus*. Descriptive notes concerning these larval exuviae are also added.

More information is needed to solve all the problems entailed in arranging the Agriogomphines systematically. The generic placement of *Cyanogomphus tumens* still remains doubtful and the classification of the immature stages is in most cases not definite because of lack of the reared material needed for the generic and specific determination.

## **Agriogomphus** Selys, 1869

### **Agriogomphus sylvicola** Selys

Fig. 51–60, Pl. V

*Agriogomphus sylvicola* SELYS 1869, Bull. Acad. Belg. (2) *28*, p. 190.
*Agriogomphus sylvicola* KIRBY 1890, Catalogue, p. 72.
*Agriogomphus sylvicola* WILLIAMSON 1919, Occ. Pap. Mus. Zool. Univ. Mich. *63*, p. 8, pl. 1 fig. 1 (wings).
*Agriogomphus sylvicola* FRASER 1943, Proc. Ent. Soc. Lond. B, *12*, p. 163, 164, fig. 1–2 (male).
*Agriogomphus sylvicola* NEEDHAM 1944, Trans. Amer. Ent. Soc. *69*, p. 181–184, pl. 14 fig. 2a–b (larva).

This species is still represented in the Brussels Museum (ISNB) by the two type specimens of DE SELYS. Both females are in fairly good condition and through the abdomen of one a fine skewer has been passed. This specimen carries at the pin the labels "St Paulo" and "Agriogomphus sylvicola Bates". E. B. WILLIAMSON (1919) published a photograph of its wings. I now add a free-hand sketch of its vulvar scale (Fig. 51).

Some characters of the wing venation of this female specimen are: Antenodal and postnodal cross veins of first series 9:13–13:10/ 11:10–11:9 in front and hind wings respectively. First and fifth antenodal cross veins strengthened. Intermedian cross veins 5–5/3–3 in front and hind wings respectively. A single row of five (left) and six (right) cells in anal field of front wings proximal to the triangle.

Five paranal cells and two postanal cells in hind wing. One row of cells behind vein Cu2 in front wing and two rows of cells behind vein Cu2 in hind wing. There are extra cubito anal cross veins in the front wings. Dimensions: length of abdomen 27 mm; length of hind wing 22 mm; costal edge of pterostigma of front wing 2.8 mm.

The other female may be conspecific with the preceding one. It bears the pin labels "172" and "172 Gomphus sylvicola B".

The wing characters noted of this additional specimen are: Antenodal and postnodal cross veins of first series 9:12–13:9/8:11–11:8 in front and hind wings respectively. First and fifth antenodal cross veins strengthened. Intermedian cross veins 3–3/3–3 in front and hind wings respectively. A single row of seven (left) and six (right) cells in anal field of front wings proximal to the triangle. Six (left) and five (right) paranal cells in hind wings. One row of cells behind vein Cu2 in front wing. Two rows of cells behind vein Cu2 in hind wings but left hind wing with an extra cell for a third row. Dimensions: length of abdomen 29 mm; length of hind wing 23.5 mm; costal edge of pterostigma of front wing 3 mm.

When examining material preserved in alcohol which had been obtained on October 22nd, 1961, by sifting decaying vegetable matter from water about knee-deep at the Troelinde Creek near to the airport of Zanderij, I discovered among a lot of Gomphine larvae a full grown *Agriogomphus*. The larva was a female and sufficiently developed for the venation in the wing cases to be studied in nearly every detail. Immediately I went to the same part of Troelinde Creek where I had previously obtained this larva and luckily enough three other larvae in the ultimate instar were again secured. They all were caged for rearing. The date of collection was August 5th, 1962. On the 14th of the same month a female emerged, on the 25th a male and on September 25th another female. On October 3rd, 1963, two further male larvae, ready for transformation, were collected at the same spot. They transformed to the adult stage after a few days. Another mature larva was taken from Carolina Creek on September 25th, 1963. It was a female and emerged on October 2nd, 1963.

The specimens seem to be conspecific with DE SELYS's *Agriogomphus sylvicola*. The females do not differ from the two type specimens except, of course, in their colours. A diagram is given of the pterothorax of the second female emerged (Fig. 54) but the colour pattern was not clear. It may be different in some details in fully mature specimens. This applies particularly to the sides of the pterothorax (see also the remarks about the colour pattern of a newly transformed male of *Ebegomphus conchinus*).

In 1942 Dr. GEIJSKES reared a female larva of *Agriogomphus* from Surinam. The imago and the empty larval skin from which it had emerged were sent to Professor NEEDHAM for description. NEEDHAM described them in his paper of 1944 under

*Agriogomphus sylvicola*. The female could not be located in the Odonata collection of Cornell University but the larval exuvia was found. The skin, which was preserved in alcohol, is identical to those of the reared specimens. The dorsal hooks of the abdomen are small on segments three, four and five, high and marked on segments six to nine; the abdomen is widest on segments five and six; and the wing cases reach backwards to well beyond the fifth segment.

The dimensions of the larval exuvia associated with the female which emerged on August 14th, 1962, are: total length 13.9 mm; length of abdomen 9 mm; greatest width of abdomen 6 mm; width of head over the eyes 3.8 mm; length of posterior femur 5.4 mm. Figures are given representing the larval exuvia and some larval structures of this specimen.

The total length of the larval cast-off skin of the male which emerged on August 25th, 1962, measures 13.5 mm; length of abdomen 8.5 mm; greatest width of abdomen 5.6 mm; width of head over the eyes 3.8 mm; length of posterior femur 5 mm.

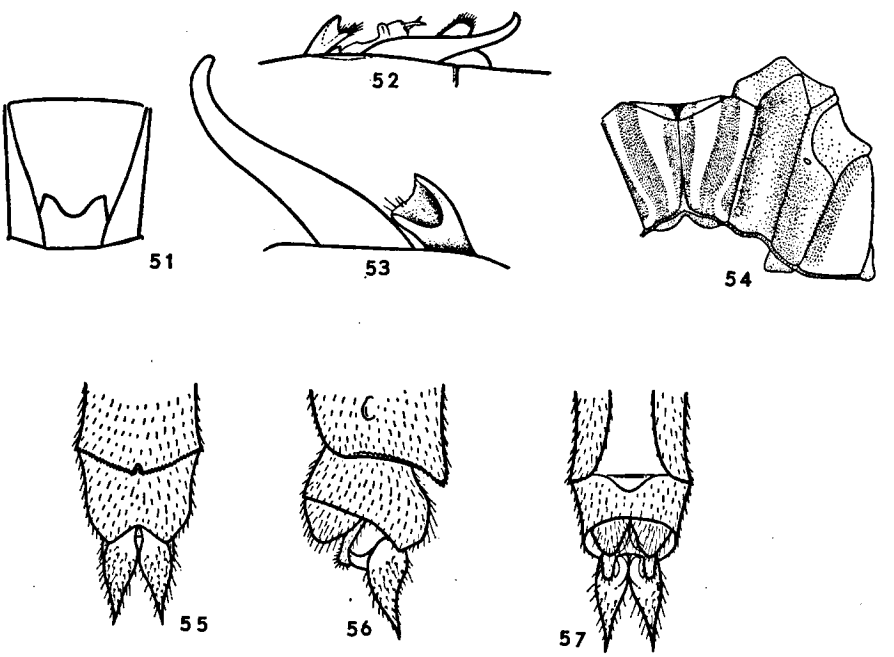


Fig. 51–57. *Agriogomphus sylvicola* Selys. — 51. Vulvar scale of holotype female (free-hand sketch). 52. Genitalia of male from Suriname, right lateral view. 53. Genitalia of allotype male, left lateral view (redrawn from D. E. KIMMINS's camera-lucida pencil sketch). 54. Diagram of synthorax pattern of female which emerged 25.IX.1962. 55. Caudal appendages of male from Suriname, dorsal view. 56. The same, left lateral view. 57. The same, ventral view.

The male *Agriogomphus sylvicola* is smaller and more slender than the female. It approaches the male of the genus *Ischnogomphus* as regards the conformation of the caudal appendages and the type of genitalia of abdominal segment two. In the venation of the wings it resembles it owing to the absence of a well-defined male triangle in the anal angle of the hind wing and by the presence of a single row of cells behind vein Cu2 in the front wing, but it differs markedly from it in that it possesses a single row of posttrigonal cells in the front wing.

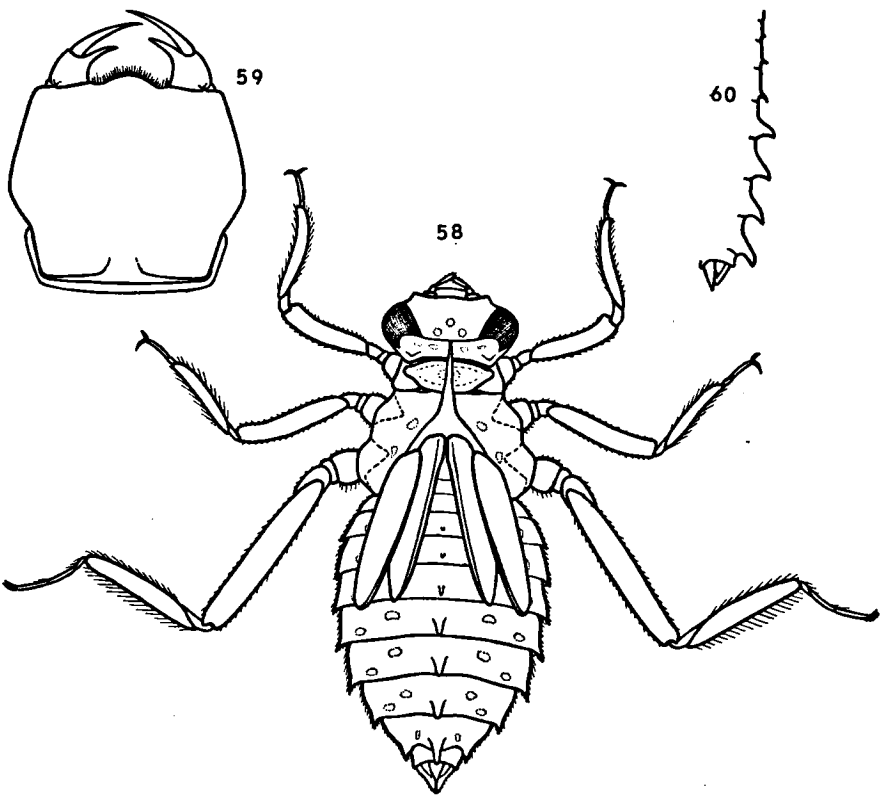


Fig. 58–60. *Agriogomphus sylvicola* Selys from Suriname. — 58. Larval exuvia, dorsal view. 59. Labium of larval exuvia. 60. Skyline of abdomen and caudal appendages of larval exuvia, left lateral view.

In 1943 the late Lt. Col. F. C. FRASER described and illustrated an Agriogomphine male specimen from near Iquitos, Perú, under *Agriogomphus sylvicola*. The three males reared by myself fit the somewhat meagre description of this specimen, but they differ in some respects if comparison is made with the accompanying figures. These, however, seem to be unreliable; the base of the left front wing (loc. cit. p. 164, fig. 2, no. 1) does not tally with that shown in the figure of the entire wings (loc. cit. p. 162, fig. 1) in having the arculus nearly at the first primary antenodal, the cubito anal crossing more proximal, etc. I have asked Mr. D. E. KIMMINS to compare and report on the figures published by FRASER. This he has kindly done in a letter (dated April 21st, 1964) as follows: "We do have the allotype male of *Agriogomphus sylvicola* described by Fraser. It is complete with the exception of the penis, which was removed by Fraser for study and not re-attached to the specimen. Now to deal with the points you mention. 1. The ear-shaped anterior hamule is not extended caudad quite as far indicated by Fraser, and the posterior hamule is not quite so acute at the apex. I enclose a pencil sketch (by camera lucida) which I hope will make this clearer. 2. Fraser's figure of the denticles on the posterior border of segment eight is quite misleading. They are in fact small and very numerous. The posterior margin is not noticeably excised mid-dorsally. 3. The posterior border of segment 9 also has many small denticles and a very small, mid-dorsal excision. 4. The tenth segment has two coarse denticles on one side and four on the other. The mid-dorsal excision is broadly concave, not angular as in Fraser's figure." In the light of these observations, the remaining differences which exist between the presumed allotype male from Iquitos and the three males before me do not appear to be of importance.

I have redescribed below the male *Agriogomphus sylvicola* from a reared specimen.

Length of abdomen 27.5 mm; length of hind wing 22 mm; costal edge of pterostigma of front wing 2.9 mm.

Face nearly devoid of hairs. It is preponderantly greyish-green, but brownish at rear of labrum, anteclypeus (rhinarium) and depressed areas of postclypeus (nasus). There is furthermore a broad, pale anterior band over nearly the entire width of the labrum. The free border of the labrum is concave and fringed with stiff, brownish hairs oriented forward. Genae greyish-green. Vertex dark brown, yellowish between the paired ocelli, greyish-green below them. Scapes greyish-green. Antennae dark brown, first distaliae with a broad, pale ring at their upper edges. Compound eyes bluish-green. Occiput low, rounded above, provided with very sparse, fine, pale hairs. Rear of head deeply concave, on top inflated behind the eyes to the re-entrant angle in the eye border as in other Agriogomphines. Occiput and inflated welt dark brown. Below the welt the rear of the head is greyish-green.

Prothorax brown, but frontal border of first lobe, sides and middorsal part of middle lobe greyish-green.

Pterothorax obscure. In front a pair of brown submedian stripes separated only by the pale carina. The brown antehumeral stripe is complete, reaching from antealar sinus to anterior mesothoracic margin. The stripes between the submedian and antehumeral stripes are green with an undertone of blue; they diverge slightly downward and are about two and a half times wider at their lower ends than at their upper ends. First lateral (humeral) stripe brown. The colour pattern on the sides of the pterothorax is not clear. The second and third lateral stripes seem to be ill-defined; they are brown on their upper parts. Posterior half of metepimeron pale.

Femora brown, the green ventral sides irregularly marked with black spinules, the last spine at the lower joint being the longest. Dorsal sides of tibiae brownish, the ventral sides pale. Tarsi brownish. Claws pale brownish, tip of first hook black.

Wings hyaline, veins dark brown. Pterostigmata brownish, surmounting four to five cells, with a weak brace vein to all four of them. Antenodal and postnodal cross veins of first series 9:11–11:9/8:9–9:9 in front and hind wings respectively. First and fifth antenodal cross veins thicker than the others, except in right hind wing, where the first and fourth are thicker. Intermedian cross veins 4–4/2–2 in front and hind wings respectively. Middle fork (Mf) almost symmetrical; it is slightly askew forward. Discoidal triangles small, the distal side straight. The front sides of the triangles of the front wings are broken near the outer end. There is no extra cubito-anal cross vein in the wings of this specimen. The single row of cells beyond the triangle of the front wing is 11 cells long. The single row of cells beyond the triangle of the hind wing starts with an extra cell against the triangle, the extra initial cell of the right hind wing is very large. The single row of posttrigonal cells in the left hind wing consists of five cells and that of the right hind wing of four cells up to the nodus, after which there are two rows of cells for a distance of two cells on the left hind wing and two rows of cells for a distance of three cells on the right hind wing. The front wings have seven (left) and six (right) paranal cells (NEEDHAM). The hind wing has five paranal cells and two postanal cells (WILLIAMSON). The fifth paranal

cell is the first postanal cell; it is hexagonal. The fourth and fifth paranal cells are distinctly larger than the others. There are two rows of cells behind vein Cu2 of the hind wing.

Abdomen preponderantly brown, darker on apical segments. Segments three to seven have pale, white basal dorso-lateral spaces. Hamuli of genital pocket on second segment pale, but front of anterior hamule and apical end of posterior hamule brown. Anterior hamule small and slender, its apex ear-shaped hollowed out and provided with soft hair. Posterior hamule entirely bare except for the ventral side. It is long and slender, gradually tapering to apex and when strongly directed caudad it reaches to beyond hind lobe ("hood of the penial peduncle", NEEDHAM; "gaine du penis", HAGEN) for about a third of its total length. Penis guard ("sheath of penis", TILLARD; "cuillière", HAGEN) with a crest-like ventral ridge. Tip of penis guard ending in two blunt teeth separated by a round notch. Tip of penis ending in two pale, short filements, the length of the latter being about half the width of the third penial segment. Hind lobe dark brown, its hind border deeply excised. Posterior border of segment 9 has a small, middorsal excision. Segment 10 exavated below, its posterior border on dorsum V-shaped concave. There is a small denticle on one side of the posterior border of segment 10, the other side has none. Superior appendages as long as the tenth segment, pale, brownish toward apices, blackish on acute points. Ventral spurs of superior appendages brownish; they lie snugly between the branches of the deeply U-shaped inferior appendage. The inferior appendage is dark brown. The tips of the branches of the inferior appendage reach to just beyond the inferior spurs of the superior appendages.

The male here described bears the label "Surinam, Zanderij, Troelinde Creek, 3.X.1963; emerged on 7.X.1963 (Paramaribo)". It is dried preserved in the author's collection and a fine skewer has been passed through its abdomen to give it additional support. The drawings of the caudal appendages were made when the specimen was freshly killed.

## **Ischnogomphus** Williamson, 1918

The genus *Ischnogomphus* WILLIAMSON, 1918 has hitherto been represented by a unique male specimen *Ischnogomphus jessei* WILLIAMSON from Cristalina, Colombia (Occ. Pap. Mus. Zool. Univ. Mich. *52*, p. 10–14, pl. 1 fig. 1, pl. 2 fig. 5–8). To this species a second from Surinam may now be added.

The holotype male of *Ischnogomphus jessei* Williamson was kindly lent to me for comparison from the collection of the Museum of Zoology, Ann Arbor, Michigan. The Surinam congener is readily distinguished from it by colour differences; in the venation of the wings it is distinguished by the strong single row of posttrigonal cells in the hind wing; in genitalia by the more slender anterior hamule; and in the conformation of the penultimate abdominal segment by the shorter middorso-posterior prolongation of the tergite. The ninth segment is one and a third times as long middorsally as midventrally; in *Ischnogomphus jessei* one and a half times. It is similar to *Ischnogomphus jessei* but differs remarkably from *Agriogomphus sylvicola* in the character of the thoracic markings; in the venation of the wings in that it has two rows of posttrigonal cells in the front wings; and in the genitalia of abdominal segment two in that the apical end of the posterior hamule becomes abruptly more slender.

On the other hand the larva hereinafter described and which seems to belong to *Ischnogomphus* resembles more closely that of *Cyanogomphus* (after NEEDHAM) than it does that of *Agriogomphus*. I therefore prefer to reinstate the genus *Ischnogomphus* until more is known about the larval stages of the Agriogomphines.

### **Ischnogomphus ericae** nov. spec.

Fig. 61–71, Pl. VI

Male (holotype) – Total length 40 mm; length of abdomen 32 mm; length of hind wing 23 mm; costal edge of pterostigma of front wing 3 mm.

Compound eyes blue-green in upper part, yellow-green in lower part. The ommatidia become suddenly about three times larger on the upper part at the front. Ocelli green and set in forward facing

areas. Lateral ocelli about three times closer to compound eyes than to each other. Face greyish-green; its vertical part polished and bare. Superior surface of frons scantily covered with hair. Labrum with a basal brownish spot. Frontal border of labrum concave and scantily fringed with hair. Anteclypeus brownish on its lower part. There is a fine brown line between anteclypeus and frons. Vertex brown, green near ocelli. Keel behind paired ocelli bilobate, concave in the median line. Occiput and upper part of rear side of head brown. Occiput low, posteriorly straight, rounded off upwards, the rear side scantily covered with short hair. Rear of head superiorly swollen as in the case of other Agriogomphines described. It is green below the inflated welt, the temporae having a brown spot. Antennae black, scapes dark brown and broadly ringed with greyish-green at

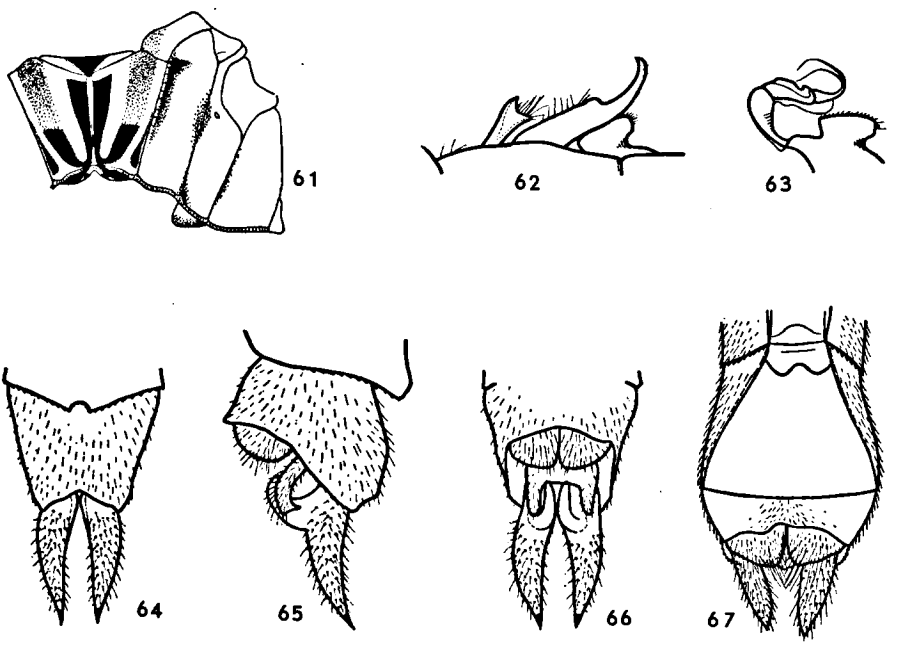


Fig. 61–67. *Ischnogomphus ericae* nov. spec. from Suriname. — 61. Diagram of synthorax pattern of male. 62. Genitalia of male, right lateral view. 63. Penis, right lateral view. 64. Caudal appendages of male, dorsal view. 65. The same, left lateral view. 66. The same, ventral view. 67. Apical segments of female abdomen, ventral view, showing vulvar scale (dried specimen).

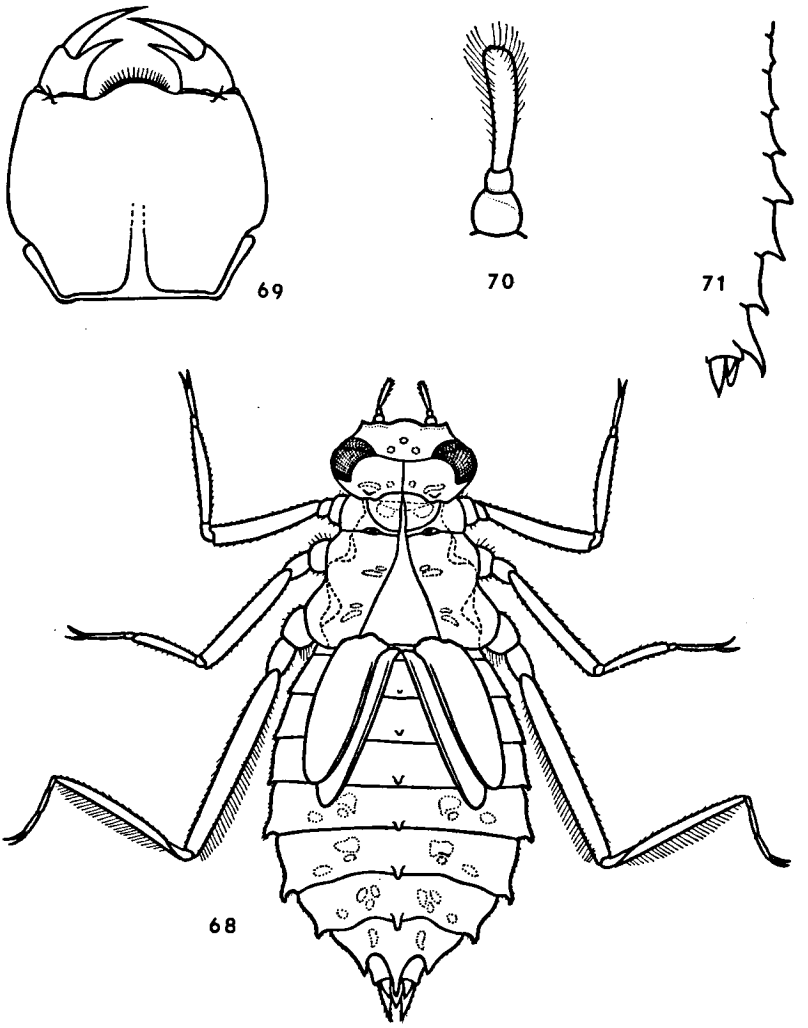


Fig. 68–71. *Ischnogomphus ericae* nov. spec.? from Suriname. — 68. Larval exuvia, dorsal view. 69. Labium of larval exuvia. 70. Right antenna of larval exuvia, dorsal view. 71. Skyline of abdomen and caudal appendages of larval exuvia, left lateral view.

their upper edge. Genae and basal half of mandibles greenish. Tips of mandibles black. Labium and adjacent mouth parts yellowish.

Prothorax mainly brown, first lobe paler along its frontal border, hind collar with a transverse tawny yellow band and fringed with pale hair. There is a deep furrow between the first and second lobe.

Pterothorax green, posteriorly more yellowish. The black markings as described for *Ischnogomphus jessei*, but posthumeral stripe somewhat wider and midlateral stripe better defined lower down; metepimeron without obscure markings. Frontal surface of pterothorax finely wrinkled. Ventral side of pterothorax and coxae pruinose.

Femora brownish, darkened on dorsum of first two pairs. Ventral surface of all femora thickly covered with black spinules. Tibiae and tarsi as described for *Ischnogomphus jessei*. Claws pale brownish.

Wings hyaline, veins dark brown. Pterostigma brown, covering four (right wings) and three (left wings) cells. Antenodal and postnodal cross veins of first series 8:13–12:10/9:9–9:8 in front and hind wings respectively. First and fifth antenodal cross veins strengthened in front wings, first and fourth antenodal cross veins in hind wings. Intermedian cross veins 3–4/4–3 in front and hind wings respectively. The front wing has a single row of seven cells in anal field proximal to the triangle and a single row of cells behind vein Cu2. The hind wing has six paranal cells and two postanal cells, the fifth paranal cell is greatly enlarged. Vein Cu1 strongly curved to vein M4. The single row of posttrigonal cells of the right hind wing starts with an extra cell against the triangle, that of the left hind wing starts with two extra cells against the triangle. There are two rows of cells behind vein Cu2 of the hind wing.

Abdomen very slender, suddenly widened on apical half of segment seven, with sides parallel or nearly so on the subsequent segments. First three basal segments green for the greater part, darkened on dorsum and on auricles, blackish on apex of third segment. Sides of segment three provided with a median, transversely running, brownish stripe. Segments four to seven blackish with greenish-yellow basal dorso-lateral spaces, reaching back on segments 4 and 7 about half the length of the segment, on segment 5 about two-fifths and on segment 6 about a third of the length of the

segment. Segments 8 to 10 blackish, segment 8 being lighter along the submedian ventral carinae. Segment 10 is about twice as long on the dorsal side as it is on the ventral side.

Anterior hamule pale brownish, its apical border provided with pale hairs. Posterior hamule greyish-green, its tip brown; short pale hairs on basal half, the tip bare. Tip of penis ending in two pale appendages which are about as long as the third penial segment. Penis guard with a huge ventro-apical crest. Hind lobe darkbrown, narrower at base if viewed sideways, its apical hind border medianally deeply excised.

Superior caudal appendages pale, brown on acute apices and on ventral spurs. Inferior appendage brown, the upturned tips of the branches black. In all other respects the anal appendages are as described for *Ischnogomphus jessei*.

Female (allotype) – Total length 41 mm; length of abdomen 32 mm; length of hind wing 25 mm; costal edge of pterostigma of front wing 2.7 mm.

Coloration of body like that of male but colour of upper part of compound eyes greyish-green instead of blue-green. Face green, labrum as in male.

Abdomen slender, hardly widening at both ends. Subgenital plate black, very short, medianally slightly excised, the outer edges round. Anal appendages brownish.

Pterostigma covering four and a half cells in right wings, five cells in left front wing and nearly four cells in left hind wing. Antenodal and postnodal cross veins of first series 11:14–13:10/10:11–11:11 in front and hind wings respectively. First and fifth antenodal cross veins strengthened. The anal area of the front wing has a single row of seven cells proximal to the triangle. Intermedian cross veins 3–4/2–2 in front and hind wings respectively. Four (left) and five (right) paranal cells in the hind wings. Three (left) and two (right) postanal cells in hind wings. Beyond triangle of hind wing there is an extra cell at the beginning of the single row; the single row of cells is three cells long in the right hind wing and two cells long in the left hind wing. There is a single row of cells behind vein Cu2 in the front wing and there are two rows of cells behind vein Cu2 in the hind wing.

Holotype male: SURINAME, Upper Para River, 8.IX.1962; allotype female: the same, 10.VIII.1960. The type specimens are in the author's collection.
Paratypes: SURINAME, Zanderij, Troelinde Creek, 26.VII.1958, 1 ♂; Upper Para River, 4.X.1959, 2 ♂♂; 10.X.1959, 1 ♂; 21.X.1959, 1 ♂; 10. VIII.1960, 1 ♀; 20.VIII.1960, 1 ♂; 15.X.1961, 5 ♂♂; 4.IX.1962, 3 ♂♂, 1 ♀; 8.IX.1962, 1 ♂, 1 ♀; 4.X.1962, 1 ♂.

Specimens were sent to the Museum of Zoology, Ann Arbor, Michigan and to the Museum of Natural History, Leiden, Holland.

In the anal field (proximal to the triangle) of seven front wings (17%) of these specimens one or two extra cells form a second row. One to three extra cells form a second row behind vein Cu2 in nine front wings (21%). There are two rows of cells beyond the triangle of three hind wings (7%) and two rows of cells behind vein Cu2 (without any extra cell for a third row) in all hind wings (100%).

The behaviour of this species is comparable to that of its Colombian congener as characterized by WILLIAMSON in his description of *Ischnogomphus jessei*. The males behave unobtrusively and are hardly noticed because of their obscure pattern. If disturbed, they fly a short distance to a twig or leaf of the surrounding bushes and the flight is swift and direct with no fluttering or hovering. The male specimens were found close to the water squatting in partly shaded places on sandy banks. The males were observed for some time from the stream bed on several occasions and appeared to be waiting for females, which fly close to the banks when visiting the creek. Two females were collected in flight and two were taken about thirty metres from the creek while they were resting on horizontal leaves of the lower branches of the trees.

In 1905 PH. P. CALVERT described *Cyanogomphus tumens* on the basis of a single female specimen from Atoyac, Vera Cruz, Mexico (Biol. Centr.-Amer., Neuropt., p. 169; tab. 7 fig. 11–11a, 41). The generic status of this species is doubtful and will continue to be so as long as the male is unknown. E. B. WILLIAMSON (Occ. Pap. Mus. Zool. Univ. Mich. *52*, p. 9, pl. 1 fig. 2) remarked about this species: "When C. tumens is better known it may be found to belong to another genus. I believe such will proved to be the case and it is not improbable that it will be found to more resemble Ischnogomphus than the eastern South American Cyanogomphus". It is to be remembered that WILLIAMSON was only acquainted with a single specimen of *Ischnogomphus*, namely his genotype male *Ischnogomphus jessei* from Colombia. But *Cyanogomphus tumens* also shows affinity to the new species *Ischnogomphus ericae* because of the strong single row of cells in the proximal part of the trigonal interspace of the hind wing. It seems, however, to be placed beyond the boundaries of the genus *Ischnogomphus* by the presence of two rows of cells behind vein Cu2 in the front wing and three rows of cells behind vein Cu2 in the hind wing. The ultimate generic placement of the species may well have to await the collection of further specimens.

The author has added a free-hand sketch (Fig. 92) of the vulvar scale of the holotype female *Cyanogomphus tumens*, which is in the collection of the British Museum. Other data concerning this specimen are: antenodal and postnodal cross veins of

first series 10:15–15:8/9:11–12:9 in front and hind wings respectively; intermedian cross veins 4–5/3–3 in front and hind wings respectively; a single row of seven cells in anal field of front wing proximal to the triangle; six (left) and five (right) paranal cells in hind wings; two postanal cells in hind wing; the three rows of cells behind vein Cu2 is for a distance of four cells each in both hind wings.

LARVA of ISCHNOGOMPHUS

Professor NEEDHAM described in his Neotropical Gomphine paper of 1940 an Agriogomphine larva and classified it as *Cyanogomphus*, but he doubtfully referred it to *Cyanogomphus waltheri* (Trans. Amer. Ent. Soc. *65*, p. 382–384, pl. 21 fig. 27–29). The generic determination was based on characters which he had found in his study of the venation of the developing larval wings. NEEDHAM did not publish the sex of the larva, but for its generic reference he used venational characters derived from a male, in this case those of *Cyanogomphus waltheri*.

Another similarly marked larva, briefly described in the same paper under the heading "Cyanogomphus sp." (p. 348, pl. 21 fig. 32), differs in the form of its abdominal skyline from that of the preceding specimen, but resembles closely that of a cast-off skin taken by myself from the Troelinde Creek near Zanderij on 26.VI.1958. There are strong reasons for referring this exuvia to the species *Ischnogomphus ericae*. The locality and venation as far as is visible in the empty wing sheaths are in accordance with such a supposition. The course of the principal veins is clearly evident; the shape of the hind wing discal space just beyond the triangle resembles closely that of *Ischnogomphus ericae* in the sharp bend of vein Cu1. The cross veins, unfortunately, are only very faintly discernible so that the cells cannot positively be determined, but it would appear that the hind wing has one row of cells in the proximal part of the trigonal interspace and two rows of cells behind vein Cu2. I have added some descriptive notes of this larval skin, which is that of a female and which was apparently left behind on transformation to the adult stage. The specimen is in the author's collection.

Dimensions: total length 16 mm; length of abdomen 11 mm; greatest width of abdomen 7 mm; width of head over the eyes 4 mm; length of posterior femur 6.5 mm.

Body sandy-brown, patternless but darkened along lower margins of tibiae and between dorsal hooks of abdominal segments six to nine. Skin granulated, marked with bare scars as described by NEEDHAM for *Cyanogomphus*, but rear of head has two pairs of scars. Ventral side of abdomen has a pair of straight sutures running longitudinally over segments two to nine, curving to the sides at base of segment two, ending on segment nine at lateral spines. Clusters of scars are outside of these sutures; on segment nine within. Third antennal segment two and a half times longer than first and second segments together. Labrum four times wider than long; its frontal margin heavily fringed with hair. Labium short and wide, and when pressed to under side of body its middle hinge reaches to synthorax. Mentum a fifth wider than long, widest just beyond middle, sides convex. Median lobe a quarter circle, fringed with about twenty stiff, pale hairs diminishing in length towards sides. Frontal margin of median lobe a fourth of the width of the mentum. Bases of lateral lobes well within corners of mentum. Lateral lobes stout, shorter

than end hooks. End hooks three-fifths the length of the big movable hooks. End hook and movable hook similarly curved but movable hook more acutely pointed. Synthorax widening to rear; it is one and two-thirds the width of the head at the level of the bases of the third pair of legs. Posterior femora when pressed close to the body reach to abdominal segment eight. Legs moderately provided with hair. Wing cases reach back well on to abdominal segment six. Abdomen broad and flat, widest on segment six, its length about one and two-thirds the width of segment six. Lateral spines on segment three small, increasing in size on segments four to seven and successively shorter on segments eight and nine. Dorsal hooks small on segments three, four and five, large on segments six, seven and eight. Dorsal hook on segment nine greatly enlarged, projecting backwards like a horn over segment ten and above caudal appendages as described by NEEDHAM for *Cyanogomphus*. Dorsal hooks and spines of abdomen clothed with dense pubescence. Caudal appendages bluntly tipped, pubescent. Inferior appendages (paraprocts) one and a half times longer than segment ten. Relative mature lengths of lateral appendages (cerci), superior appendage (epiproct) and inferior appendages in this order about 6,8 and 10, the last being taken as the standard for comparison.

## **Ebegomphus** Needham, 1944

### **Ebegomphus demerarae** (Selys)

Fig. 72–82, Pl. VII

*Cyanogomphus demerarae* SELYS 1894, Ann. Soc. Ent. Belg. *38*, p. 173.
*Ebegomphus strumens* NEEDHAM 1944, Trans. Amer. Ent. Soc. *69*, p. 186–187, pl. 14 figs. 4b–c, pl. 16 fig. 4e (male).
*Ebegomphus* sp? NEEDHAM 1944, Trans. Amer. Ent. Soc. *69*, p. 188–189, pl. 14 fig. 4d (female).

When I visited the British Museum on June 20th, 1961, Mr. D. E. KIMMINS showed me the incomplete (terminal segments of abdomen lost) holotype male of *Cyanogomphus demerarae* Selys from British Guiana and I was surprised to find that it appeared to be a species from Surinam which I had referred to the genus *Ebegomphus* NEEDHAM, 1944 and which I had set aside as probably new. On my return to Surinam I sent one of the male specimens to Mr. KIMMINS for examination. At my request he compared the genitalia with those of the original male and in a letter dated 18th May, 1962, he kindly let me know the outcome: "I have compared your specimen with the type, and I do not see any significant differences in either the hamule or the hind lobe. Our type (as you may remember) is somewhat immature and less pigmented, and the denticulation of the posterior margin of the hamule is slightly different, but I would not consider it more than individual variation."

The male triangle in the anal angle of the hind wing of the holotype is divided into three cells and not two as stated in DE SELYS's original description (loc. cit.: "de 2 cellules" is evidently a typographical error).

On the other hand I found that the male of *Cyanogomphus demerarae* fitted the description of NEEDHAM's *Ebegomphus strumens*, except for a few minor characters in the coloration of some details. I therefore requested Cornell University to lend me the holotype male of *Ebegomphus strumens* and Dr. L. L. PECHUMAN kindly sent me the dragon-fly (Cornell Holotype No. 3086) for examination. The body was contained in a vial with alcohol and the wings were sent on a slide. It was a specimen in very poor condition, wholly discoloured, very broken and lacking some parts of the abdomen, but fortunately the genitalia of the second abdominal segment (penis guard included), the penis (although broken) with the hind lobe and the terminal segments of the abdomen with the anal appendages were well preserved. On comparing the fragments piece by piece with the corresponding details of the male of *Cyanogomphus demerarae*, I found them in perfect conformity with each other. On this account I feel myself authorized to abandon its specific distinctness from this species. Probably NEEDHAM was misled by the typographical error in the somewhat brief description of DE SELYS when he treated this specimen as the new species *Ebegomphus strumens*, for NEEDHAM (loc. cit. p. 184) said about *Cyanogomphus demerarae:* "It shoud be recognizable because of its two-celled male triangle in the anal angle of the hind wing (in all the others, three-celled)". Nevertheless the species *Cyanogomphus demerarae* may be transferred to the genus *Ebegomphus* as proposed by NEEDHAM in his 1944 paper. DE SELYS, after describing the species, also expressed doubt about its generic placement, but he emphasized that knowledge of the missing caudal appendages was needed to determine its allocation (loc. cit.: "Il faudrait connaître les appendices anals pour décider si elle appartient réellement au genre *Cyanogomphus*, dont le type est le *C. Waltheri* des environs de Rio-Janeiro").

The female of *Ebegomphus demerarae* was described by NEEDHAM in his 1944 paper under the heading "Ebegomphus sp?". He suggested that it was the female of his *Ebegomphus strumens* but

demurred to referring it to that species on the grounds of structural differences which he had found in the venation of its wings.

Supplemental to DE SELYS's and NEEDHAM's own information, I

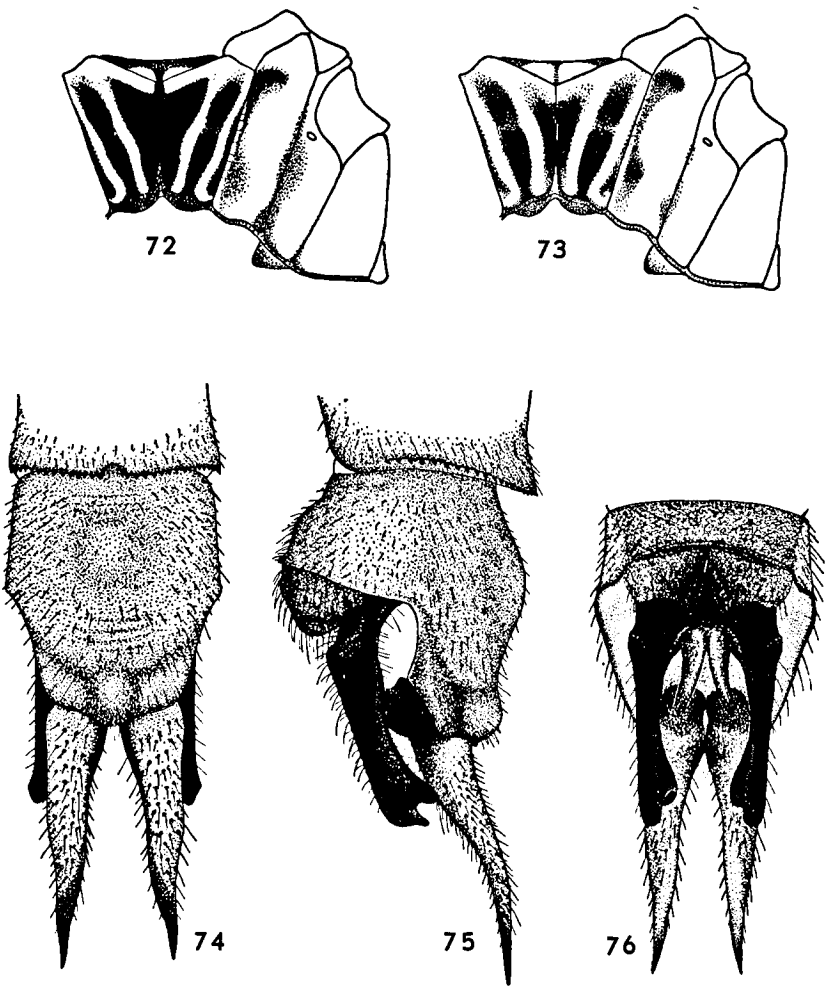


Fig. 72–76. *Ebegomphus demerarae* (Selys) from Suriname. — 72. Diagram of synthorax pattern of male. 73. The same, showing inconstency of the pattern in some specimens. 74. Caudal appendages of male, dorsal view. 75. The same, left lateral view. 76. The same, ventral view.

offer below a description of both sexes based mainly on colours. Fully mature specimens were taken when alive.

Male – Length of abdomen 36 mm; length of hind wing 23.5 mm; costal edge of pterostigma of front wing 3 mm.

Compound eyes blue in upper part, green below. Ocelli green. Labrum except for a marginal band of black along frontal border and a brown median spot on rear, anteclypeus except for the brown lower part, postclypeus except for the brown depressed areas and projecting yellowish lateral lobes and the frons except for the yellowish frontal ridge and the medially black base of the superior surface all greyish-green (In dried specimens the colours are sometimes quite different because of postmortem changes; in most cases a yellow stripe not noticeable in the living specimens is found along each side of the labrum). There is a fine brown line between clypeus and frons. Antennae black, scapes broadly ringed with yellow. Labium yellow. Vertex dark brown, lighter near ocelli. Occiput, including the remarkable, broad, inflated welt, dark brown. Rear of head dark brown; below re-entering angle of eye border there is first a spot and then a marginal band of yellow.

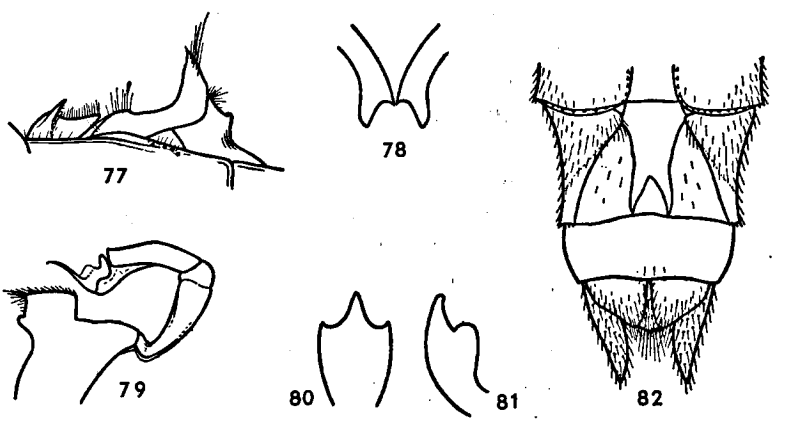


Fig. 77–82. *Ebegomphus demerarae* (Selys) from Suriname. — 77. Genitalia of male, right lateral view. 78. Anterior hamules as seen from front (upside down). 79. Penis, left lateral view. 80. Tip of penis guard as seen from front. 81. The same, right lateral view. 82. Apical segments of female abdomen, ventral view showing vulvar scale.

Prothorax brown but hind lobe with a transverse band tawny.

Pterothorax green in ground colour, posteriorly more yellowish. Middorsal triangle black, not reaching down to the anterior mesothoracic margin. Carina greenish along its extreme dorsal margin. The black antehumeral stripe more or less interrupted just below middle, upper and lower parts not connected with middorsal triangle. Humeral and especially interpleural stripe ill-defined.

Femora brown, but first pair of femora yellowish at inner sides. Tibiae black, but ventral and inner sides yellow. Tarsi and claws black.

Abdomen preponderantly obscure brown. Segment one greenish-yellow, brown on dorsum. Segment two greenish, but brown on dorsum, on the sides along basal and apical border and behind auricles. Submedian ventral carinae of segment two provided with three (left) and four (right) denticles. Auricles have about 25 denticles. Segments 3 to 7 have greenish-yellow, dorso-lateral, triangular spaces, on segment 3 reaching to apex of segment, on segments 4 to 7 not half way. Sides of segments 8 to 10 turning to yellow here and there. Sterna of abdominal segments nearly black, of penultimate segment soft, transversely wrinkled and paler. Caudal superior appendages sinuously pointed, being about as long as the tenth segment. Surface minutely tuberculate, each tubercle with a short bristle. Upper side of superior appendages pale greyish-green, brown on tips. Ventral spurs of superior appendages brown. Branches of inferior appendage nearly black, parallel, hollowed out at apex.

Appendages of genital pocket of second abdominal segment mainly pale green but anterior hamule brown on inner angle and on prominant tooth of frontal margin, and posterior hamule brown along posterior margin and dark brown on acute point of tip. Basal half of shaft of posterior hamule provided with stiff pale hairs; the bare apical half of posterior hamule with a few long pale hairs at tip. Posterior margin of tip irregularly denticulated along inner side. Hind lobe nearly black, its posterior border deeply excised. Tip of penis ending in two short appendages.

Wings hyaline. Veins dark brown, including costa. Pterostigma dark brown, surmounting 4–5 cells. Antenodal and postnodal cross

veins of first series 8:12–12:9/8:10–10:8 in front and hind wings respectively. First and fourth antenodal cross veins thicker, in right hind wing first and fifth antenodal cross veins thicker. Intermedian cross veins 4–4/3–3 in front and hind wings respectively. Anal field of front wing proximal to the triangle has a single row of 6 cells. Four paranal cells and three postanal cells in hind wing. Two rows of cells behind vein Cu2 in each of the wings.

The male here described is labelled: SURINAME, Zanderij, Troelinde Creek, 1.VIII.1959. It is in the author's collection.

Female (allotype) – Length of abdomen 32.5 mm; length of hind wing 24.5 mm; greatest width of hind wing 6.5 mm; costal edge of pterostigma of front wing 3 mm.

Similar to male as regards general coloration, but compound eyes greyish in upper part and yellow-green below.

Abdomen slender, but stouter than that of male. Segments 1 and 2 yellowish, darker on dorsum. The yellowish-green, dorso-lateral, basal, triangular spaces broader and longer than those of male. Sterna brown, darker on end segments. Hind margin of segment 10 has denticles only above bases of appendages. Caudal appendages about as long as the tenth segment, pale greyish-green, blunt pointed, surface as that of superior appendages of male. Subgenital plate strongly elongated, its tip deeply V-shaped cleft extending a third of the total length of the subgenital plate, the divisions reaching to apex of sternum of segment nine (in dried specimens sometimes well beyond the apex of the sternum of segment nine, because of contraction).

Pterostigma surmounting 4–5 cells. Antenodal and postnodal cross veins of first series 9:14–14:9/8:11–11:9 in front and hind wings respectively. First and fifth antenodal cross veins thicker. Intermedian cross veins 3–4/3–3 in front and hind wings respectively. Anal field of front wing proximal to the triangle has a single row of seven cells. Five paranal cells and two postanal cells in hind wing. Two rows of cells behind vein Cu2, but each of the wings has an extra cell for a third row.

Allotype female: SURINAME, Zanderij, Troelinde Creek, 1.VIII.1959. It is in the author's collection.

Additional material: SURINAME, Upper Coropina Creek (Dauwdropkamp), 30.VIII.1958, 1 ♂; 5.IX.1958, 1 ♀; Upper Para River, 10.VIII.1960, 1 ♂; Nickerie River (at junction with Arawara), 22.VIII.1962, 4 ♂♂; Zanderij, Troelinde Creek, 26.VI.1958, 1 ♂; 6.VII.1958, 1 ♀; 1.VIII.1959, 1 ♂; 27. VII.1960, 3 ♀♀; 16.VIII.1962, 2 ♂♂, 2 ♀♀; 19.VIII.1962, 1 ♀; Kabalebo River, 2.IX.1963, 1 ♂.

Specimens were sent to the British Museum (Natural History), London, Cornell University, Ithaca, New York and the Museum of Natural History, Leiden, Holland.

In all the hind wings of the males of these specimens the author has found two rows of cells behind vein Cu2. This is the case in four (22%) hind wings of the females; seven (39%) hind wings have one extra cell, three (17%) hind wings two extra cells and four (22%) hind wings three or more extra cells forming a third row behind vein Cu2. The gaff (fused portion of the veins Cu2 and A1 in the hind wing) is of variable length, but in the females it is generally longer than in the males.

The female from the Litani River (Feti Creek) which NEEDHAM has described and the one recorded from Coropina River were represented among the Agriogomphine material borrowed from Cornell University. The subgenital plate of the first-mentioned specimen was cleft at the apex for about a third of the entire length; the drawing (loc. cit., pl. 14 fig. 4d) published by NEEDHAM is evidently a mistake, for it does not answer to the description at all. The subgenital plate of the other female was lost with the terminal segments of the abdomen.

## **Ebegomphus conchinus** (Williamson)

Fig. 83–90, Pl. VIII

*Cyanogomphus conchinus* WILLIAMSON 1916, Ent. News *27*, p. 167–172, pl. 8 fig. 1, pl. 9 fig. 6–11.

This species may also be transferred to the genus *Ebegomphus*, as already stated by NEEDHAM in his paper of 1944 (Trans. Amer. Ent. Soc. *69*, p. 185). In colour pattern it approaches *Ebegomphus demerarae* but the dark stripes on the pterothorax are more pronounced (although the extent of these stripes varies) and the third pair of tibiae is entirely black or nearly so. The most striking differences in the male are found in the genital hamules; the antero-internal border of the anterior hamule lacks a prominant tooth and the shaft of the posterior hamule is more slender. The caudal appendages closely resemble those of *Ebegomphus demerarae;* little differences are found in the extreme tips of the branches of the inferior appendage. The vulvar scale of the female seems to offer specific differences in the Agriogomphines. It is much shorter in

*Ebegomphus conchinus* than in *Ebegomphus demerarae*, and its excised tip reaches only half the length of the sternum of the ninth abdominal segment.

Male – Length of abdomen 38 mm; length of hind wing 25.5 mm; costal edge of pterostigma of front wing 3.1 mm.

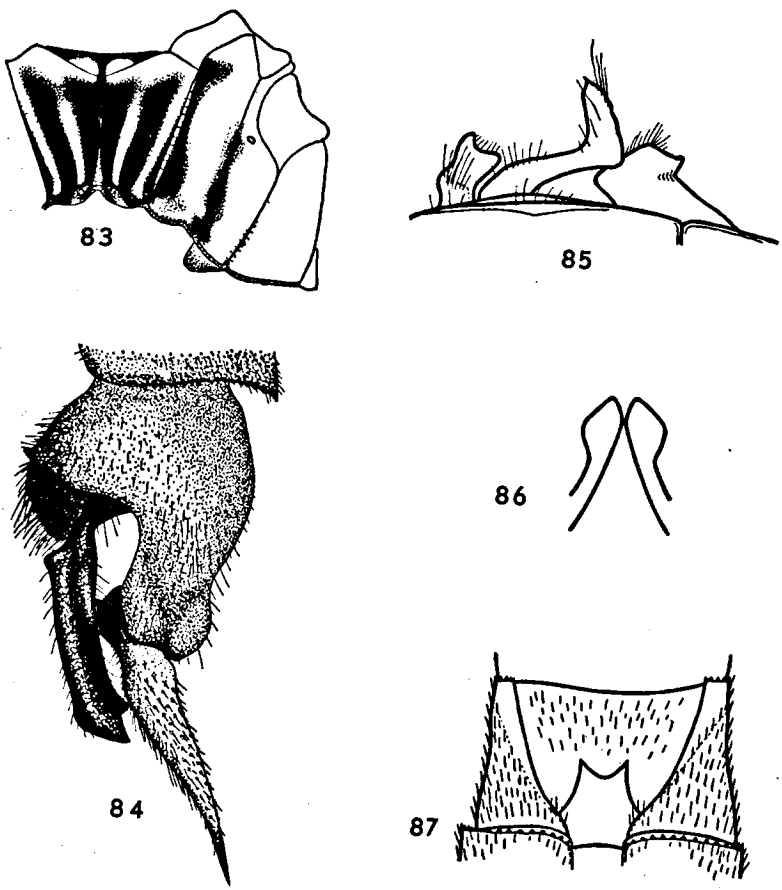


Fig. 83–87. *Ebegomphus conchinus* (Williamson) from Suriname. — 83. Diagram of synthorax pattern of male. 84. Caudal appendages of male, left lateral view. 85. Genitalia of male, right lateral view. 86. Anterior hamules as seen from front. 87. Vulvar scale of female, ventral view.

Coloration most like that of *Ebegomphus demerarae*, but marginal band of black of labrum broader; rear of head somewhat yellowish below re-entering angle of eye border; blackish stripes of pterothorax more produced; third pair of tibiae entirely black; first two pairs of tibiae with not more than a line of yellow running longitudinally at ventral sides. Genitalia of abdominal segment two as shown in the accompanying figure. Penis guard with a ventro-apical ridge, the round lateral teeth of the tip hardly produced in comparison with *Ebegomphus demerarae*. Submedian ventral carinae of second abdominal segment not armed with denticles. Auricles with about fifteen denticles.

Pterostigma surmounting 4–4.5 cells. Antenodal and postnodal cross veins of first series 10:15–15:10/10:11–12:10 in front and hind wings respectively. First and fifth antenodal cross veins strengthened. Intermedian cross veins 4–4/3–3 in front and hind wings respectively. Anal field of front wing proximal to the triangle has a single row of eight cells. Four paranal cells and three postanal cells in hind wing. Discoidal field of hind wing starting with three rows of cells against the triangle, followed by two rows of cells. Two rows of cells behind vein Cu2 in front and hind wings, but left hind wing with an extra cell for a third row.

The male here described bears the label "Surinam, Upper Para River, 1.IV.1962." It is in the author's collection.

Female (allotype) – Length of abdomen 36.5 mm; length of hind wing 27.5 mm; greatest width of hind wing 7.5 mm; costal edge of pterostigma of front wing 3.2 mm.

Very similar to male but dark stripes on pterothorax somewhat better produced and more brownish; compound eyes blue-green on upper portion, yellow-green below. Dorso-lateral green spaces of abdominal segments larger than those of male (and of *Ebegomphus demerarae* female), those of segments three and four extending to apex of segment, medially transversely interrupted. Caudal appendages paler than superior appendages of male.

Pterostigma surmounting 5–6 cells. Antenodal and postnodal cross veins of first series 12:15–18:12/11:14–12:12 in front and hind wings respectively. First and fifth antenodal cross veins thicker, but

in left hind wing first and fifth antenodal cross veins thicker. Intermedian cross veins 5–4/3–3 in front and hind wings respectively. Anal field of front wings with a single row of eight (left) and seven (right) cells proximal to the triangle. Discoidal field of wings as in male. Five paranal cells and three postanal cells in hind wing. Two rows of cells behind vein Cu2 in front wing, three in hind wing.

Allotype female: SURINAME, Upper Para River, 1.IV.1962. It is in the author's collection.
Additional material: SURINAME, Upper Para River, 4.X.1959, 1 ♂, 1 ♀; 3.VIII.1960, 2 ♀♀; 15.X.1961, 1 ♀; 25.III.1962, 1 ♂, 2 ♀♀; 1.IV.1962, 1 ♂; 4.IX.1962, 3 ♀♀; 8.IX.1962, 8 ♂♂, 3 ♀♀; 21.X.1962, 1 ♀; 24.II.1963, 1 ♂; 14.IV.1963, 1 ♂, 1 ♀; 15.IV.1963, 2 ♂♂, 6 ♀♀; 28.IV.1963, 1 ♂, 2 ♀♀.

Specimens of *Ebegomphus conchinus* have been sent to the Museum of Zoology, Ann Arbor, Michigan, and to the Museum of Natural History, Leiden, Holland.

Of these specimens the males generally have two rows of cells behind vein Cu2 of the hind wing, the females generally three. The tendency to have a third row behind vein Cu2 of the hind wing is stronger in this species than in *Ebegomphus demerarae* and this is clearly evident from the accompanying table.

PERCENTAGE OF HIND WINGS WITH EXTRA CELLS FOR A THIRD ROW BEHIND VEIN Cu2 IN *Ebegomphus*

| | | No extra cell | One extra cell | Two extra cells | Three or more extra cells | Specimens examined |
|---|---|---|---|---|---|---|
| *Ebegomphus demerarae* | male | 100% | — | — | — | 11 |
| | female | 22% | 39% | 17% | 22% | 9 |
| *Ebegomphus conchinus* | male | 67% | 30% | 3% | — | 15 |
| | female | 6% | 4% | 13% | 77% | 24 |

The holotype male of *Cyanogomphus conchinus* Williamson borrowed from the Museum of Zoology, Ann Arbor, Michigan, was collected in adjoining British Guiana. It is a teneral specimen in poor condition; the central part of the pterothorax is broken, the tips of the superior caudal appendages have been broken off and the left pair of wings have apparently been removed. There is a single row of cells in the proximal part of the trigonal interspace of the remaining right

hind wing; in the Surinam examples there is seldom a single row of cells or two rows of cells interrupted by a single cell. The pterothorax of the type specimen is very obscure. Its colour pattern approaches closely that of a newly transformed male of this species secured on the Upper Para River on February 23rd, 1963 and now (dried preserved) in my collection. The thorax pattern in fully mature specimens is quite distinct, as is clearly shown by a comparison of the accompanying diagram of a fully mature male (Fig. 83) with that of the teneral type specimen published by E. B. WILLIAMSON (1916, pl. 9 fig. 6). For example, in the male which has just emerged a broad dark stripe runs over the entire length of the metepimeron along the femoral suture; there is no such stripe on the metepimeron of fully mature specimens.

Moreover, when fresh specimens of this genus were stored for a long time in hermetically closed tins or metallic boxes the areas of the thorax which were green owing to postmortem changes became very obscure and dark markings emerged. This is the case especially in young specimens; their colour pattern then approaches in some respects that of the (teneral) type specimen.

The two *Ebegomphus* species are not rare in Surinam and have been encountered along all the non-seasonal creeks and rivers which run through the forests. They generally live high in the trees and so are seldom collected. But in sunny weather they come down at midday to fly a short time close above the water. There they fly to and fro very swiftly, while the females occasionally draw long stripes on the surface of the water with their hind abdominal segments. Sometimes during these flights they suddenly hover to reconnoitre the neighbourhood for a short time. On the Upper Para River (a tributary of the large Suriname River) a mating female *Ebegomphus conchinus* was caught. Four males were secured while they were resting on the twigs of the bushes along the banks. All the other specimens were collected in full flight.

### LARVA of EBEGOMPHUS

In his 1944 paper NEEDHAM published a description (and figure) of the larva of *Ebegomphus* under the wrong heading "Cyanogomphus sp.? (supposition)" (Trans. Amer. Ent. Soc. *69*, p. 190–191, pl. 14 fig. 4a). The cast-off skin, which was principally used for the description, was collected at Kabel Station (Suriname River) on 25.IX.1938. I have a dozen exuviae, doubtless congeneric with this larva, but all have (relatively) much smaller heads than the described exuvia from Kabel Station (width of head 6 mm). Fortunately this specimen could be located in the Cornell

University collection and it was sent to me in a vial with alcohol. The skin was in very poor condition, broken into about twenty parts. After tracing the critical parts of the face and (appurtenant) left compound eye I was able to measure the distance from the outer eye border to the centrum of the face between the paired ocelli. I found it to be 2.2 mm and from this it follows that the width of the head over the eyes is only 4.4 mm.

Along with this larval skin from Kabel Station two additional specimens came from Cornell University, one of which was a larva (also preserved in alcohol) practically in its penultimate instar; it was also from Kabel Station, but collected on 21.IX.1938. The other specimen was a cast-off skin with the locality data "Coppename, Raleighvallen, 19.VII.1943". Both specimens seem conspecific with the first one; they agree with it in structural characters and differ from it slightly in (relative)

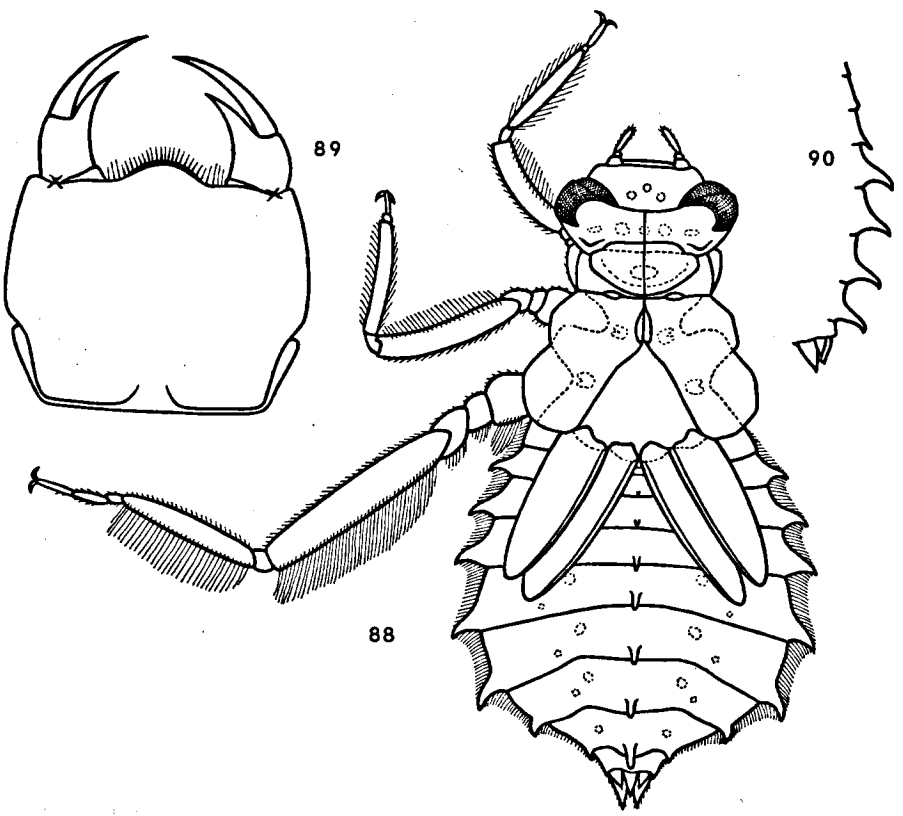


Fig. 88–90. *Ebegomphus conchinus* (Williamson) ?. — 88. Larval exuvia, dorsal view. 89. Labium of larval exuvia. 90. Skyline of abdomen and caudal appendages of larval exuvia, left lateral view.

dimensions. The immature larva's right pair of wing cases was apparently removed. I have studied the remaining pair, but the venation is not far enough advanced in development for me to determine the generic (or specific) status of the larva.

At least two different forms are distinguishable in the *Ebegomphus* exuvial material collected by myself. The differences are found in the flatness of the abdomen and in the structure of the abdominal skyline. There is no reared specimen.

## *Ebegomphus conchinus*, larval exuvia (supposition) Fig. 88–90

On February 23rd, 1963 on the Upper Para River I saw a newly transformed dragon-fly fluttering from a twig which projected about 30 cm above the water. I secured the insect when it alighted on a horizontal leaf of an overhanging branch and saw that I had caught a male specimen of *Ebegomphus conchinus*. Immediately I inspected the twig and attached to it I discovered a fresh larval exuvia of *Ebegomphus* 1 cm above the water level. On closer inspection of the twig no other exuvia was found except for a broken Zygopterous larval skin at the top of it. It may therefore be assumed with some confidence that the exuvia is the cast-off skin of the newly transformed dragon-fly caught.

Nine additional exuviae were collected at the same limited part of the creek on 20.VIII.1960, 23.IV.1962, 4.IX.1962, 23.II.1963, 14.IV.1963, 28.IV.1963 and 18.VIII.1963 along with a large number of adult specimens of *Ebegomphus conchinus*. Figures are given of the structure (body, labium, abdominal skyline) of the second dated specimen. This skin is that of a female; the dimensions are: total length 16 mm; length of abdomen 11 mm (caudal appendages included); greatest width of abdomen 9.5 mm (lateral spines included); width of head over the eyes 4.3 mm; length of posterior femur 6.5 mm. The exuviae belong to the largest ones of the series. The abdomen is nearly a fifth longer than it is wide. They are identical with the larval skin described by NEEDHAM. In two specimens the spine-like dorsal hook on abdominal segment five is more produced than that of the others. All the exuviae

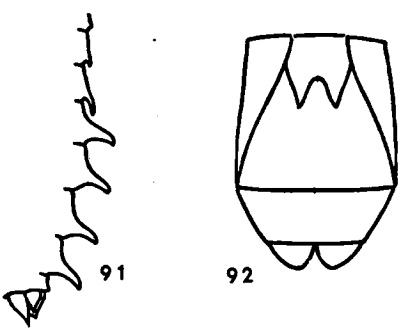


Fig. 91. *Ebegomphus demerarae* (Selys) ?. — Skyline of abdomen and caudal appendages of larval exuvia, left lateral view.

Fig. 92. *Cyanogomphus tumens* Calvert. — Terminal segments of holotype female abdomen, ventral view, showing vulvar scale (free-hand sketch).

were taken from twigs of the bank vegetation and close to the surface of the water.

There is one exuvia, collected at the same part of the creek on 4.IX.1962, which differs from those previously described in having a relatively broader abdomen (7% longer than wide). The dimensions of this specimen are: total length 14.5 mm; length of abdomen 9.5 mm; greatest width of abdomen 8.9 mm; width of head over the eyes 4 mm; length of posterior femur 6.1 mm.

## *Ebegomphus demerarae*, larval exuvia (supposition) Fig. 91

There are two exuviae, both from the Troelinde Creek and collected on 28.VII.1962 and on 5.VIII.1962, which I can refer to the species *Ebegomphus demerarae* on account of their locality (see adults) and by exclusion of its allies as far as known. The dimensions of the first dated specimen are as follows: total length 15.5 mm; length of abdomen 10.8 mm; greatest width of abdomen 8.5 mm; width of head over the eyes 4.2 mm; length of posterior femur 6.5 mm. This cast-off skin is that of a female. It was found lying on floating dead leaves and for this reason we can assume that it was left behind at transformation to the adult stage. In size it approaches the larva of *Ebegomphus conchinus* but the abdomen is relatively narrower (27% longer than wide), the dorsal hooks on the abdominal segments three and four are more produced and the spine-like dorsal hook on five is much longer and very strongly reclined rearward. I have added a figure of its abdominal skyline.

One exuvia, collected at the Kabalebo River on 4.IX.1963, is similar to these two specimens. Another exuvia, collected at the Nickerie River on 22.VIII.1962, is possibly of the same species, but it departs in the form of its abdominal skyline from the other three exuviae in that the dorsal hooks on abdominal segments three and four are nearly obsolete and the spine-like hook on five is much shorter. It was found also lying on floating dead leaves near the shore of the river. The dimensions of this specimen are: total length 15.5 mm; length of abdomen 10.8 mm; greatest width of abdomen 8.5 mm; width of head over the eyes 4 mm; length of posterior femur 6 mm.

The Agriogomphine larvae are not burrowers but rather sluggish sprawlers. They were collected in various stages by sifting leafy trash taken from pools and eddies of the creeks which run through the savannah zone near Zanderij. I never found them in the dredged mud or silt. I observed that the larvae for rearing which had been kept alive in a cage always lie flat on the bottom of it with legs outspread. If disturbed, they did not show any tendency to burrow into the leafy trash kept there, but in most cases gave the impression that they were in a state of suspended animation.

## ADDENDUM

I have never found a species of *Cyanogomphus* during my researches in the field. The genotype *Cyanogomphus waltheri* has been found in South Brazil and it is presumably not Amazonian in its geographical distribution.

From Surinam NEEDHAM obtained a fragmentary (head lost) cast-off skin which he doubtfully referred to *Cyanogomphus*. He briefly described it in his Neotropical Gomphine paper of 1944 under the heading "?Cyanogomphus? Nymph" (Trans. Amer. Ent. Soc. *69*, p. 185) but some characters fail to conform to his first definitions of typical Agriogomphine larva. The presence of a dorsal hook on abdominal segment two and the absence of lateral spines on abdominal segment three, coupled with the marked burrowing hooks on the first two pairs of tibiae, are not very convincing as evidence to corroborate his guess (as to the genus only) that it might be the larval skin of *Cyanogomphus demerarae*.

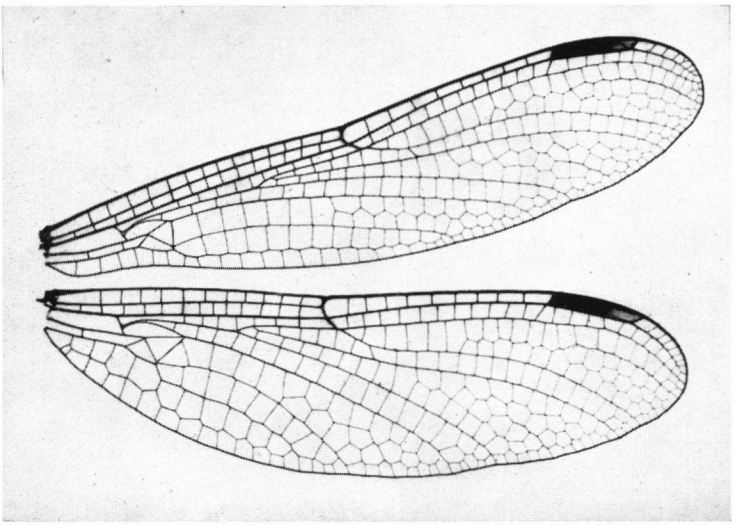

Plate Va. *Agriogomphus sylvicola* Selys. Right pair of wings of female from Suriname.

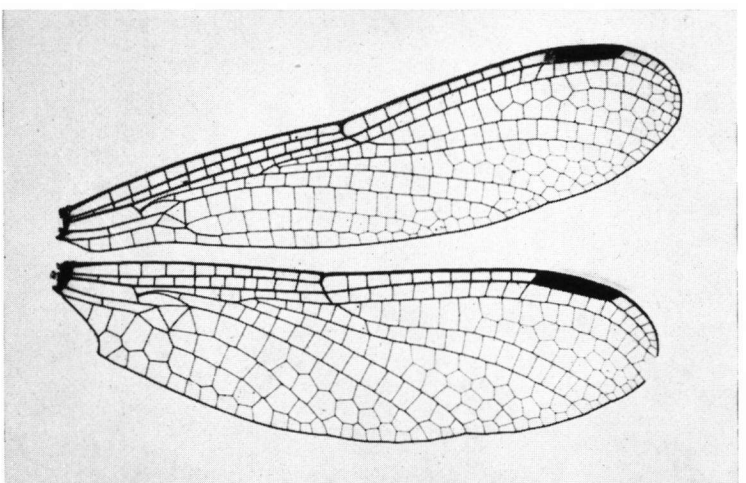

Plate Vb. *Agriogomphus sylvicola* Selys. Right pair of wings of male from Suriname.

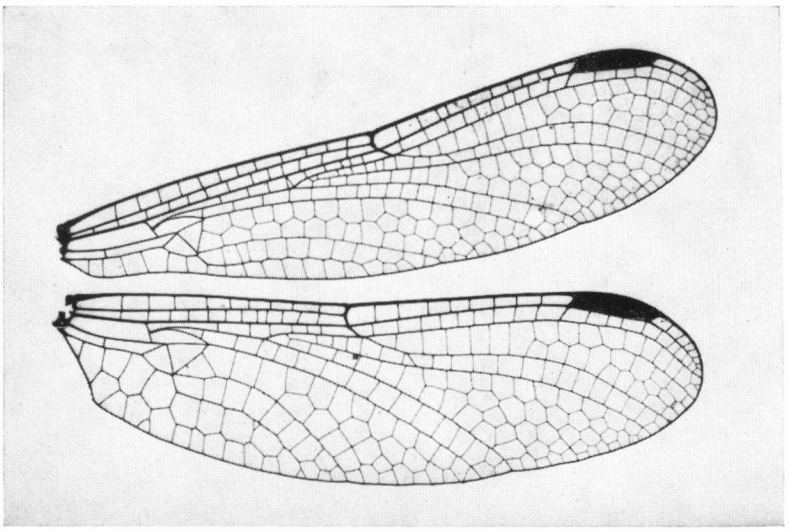

Plate VIa. *Ischnogomphus ericae* nov. spec. Right pair of wings of holotype male.

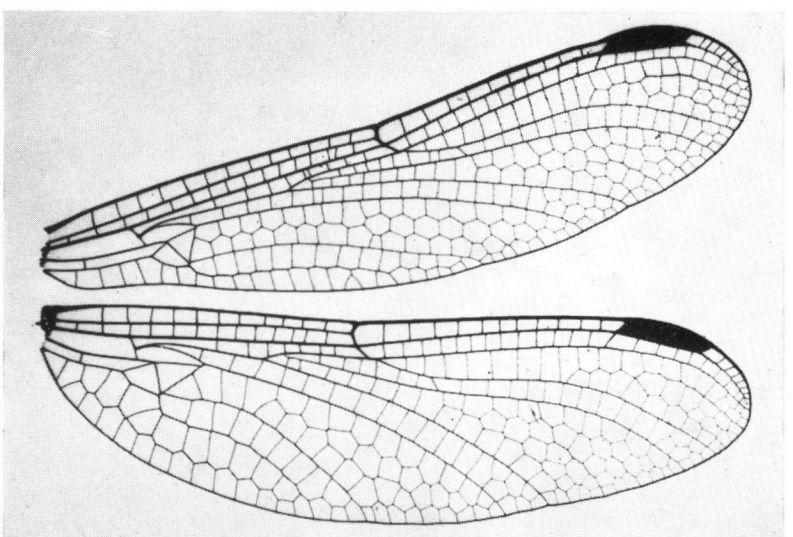

Plate VIb. *Ischnogomphus ericae* nov. spec. Right pair of wings of allotype female.

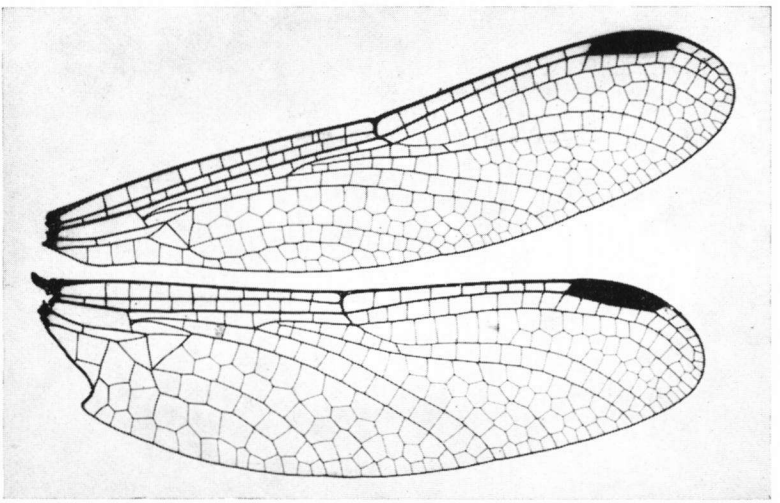

Plate VIIa. *Ebegomphus demerarae* (Selys). Right pair of wings of male from Suriname.

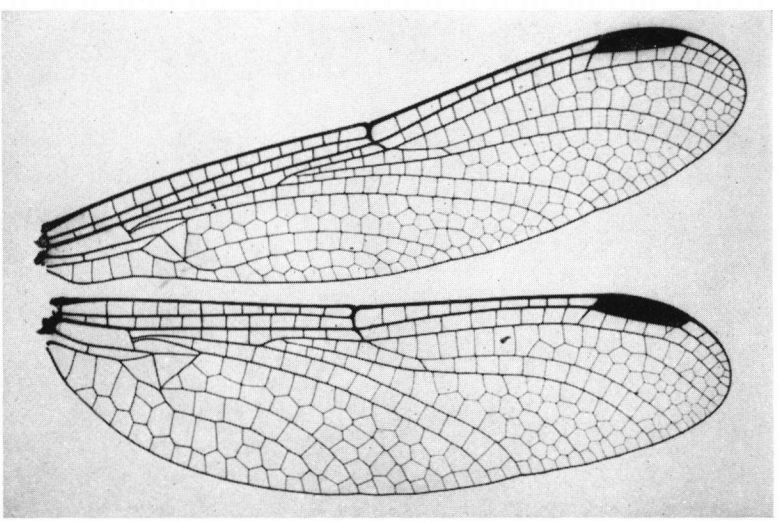

Plate VIIb. *Ebegomphus demerarae* (Selys). Right pair of wings of allotype female.

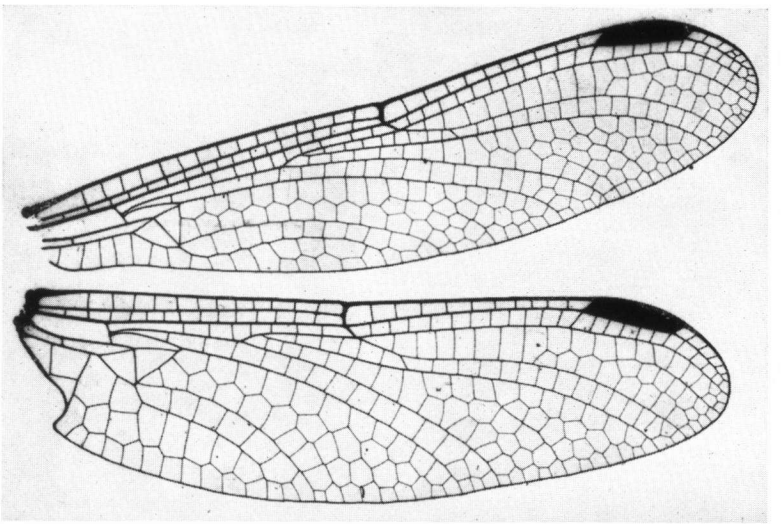

Plate VIIIa. *Ebegomphus conchinus* (Williamson). Right pair of wings of male from Suriname.

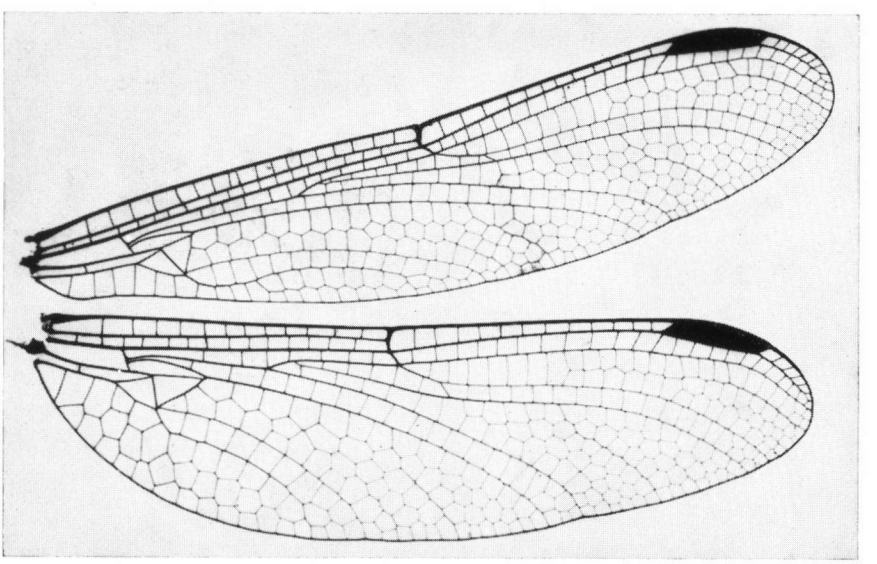

Plate VIIIb. *Ebegomphus conchinus* (Williamson). Right pair of wings of allotype female.

Plate IX. TROELINDE CREEK, Suriname. Place of capture of *Agriogomphus sylvicola*, *Ischnogomphus ericae* and *Ebegomphus demerarae*, showing typical favourable environment for these species. (Photograph L.J.J. VAN GISBERGEN)

Plate X. Upper Para River, Suriname. Place of capture of *Ischnogomphus ericae*, *Ebegomphus demerarae* and *Ebegomphus conchinus*, showing typical favourable environment for these species. (Photograph L.J.J. van Gisbergen)