

On five species of *Phyllogomphoides* Belle, 1970, from Brazil with the descriptions of three new taxa (Odonata: Gomphidae)

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The new species *Phyllogomphoides spiniventris* spec. nov., *P. suspectus* spec. nov. and *P. pseudangularis* spec. nov. are described and illustrated. The male of *P. calverti* is discussed and figured. The hitherto unknown male of *P. praedatrix* is described. A key to the South-American species of *Phyllogomphoides* is added.

Introduction

During my visit of the Museu Nacional at Rio de Janeiro in 1991 I found several specimens of *Phyllogomphoides* belonging to four elusive species from Brazil, two of them being undescribed. The material were generously handed over to me for study by Prof. Dr Janira M. Costa and for this privilege I am very grateful. Thanks to the attention of Prof. Dr Angelo B.M. Machado, Belo Horizonte, I am also able to introduce here another new taxon in *Phyllogomphoides*. The individuals belonging to it were detected by him in the collection of the Universidade do Amazonas at Manaus and kindly sent to me.

In the following pages I present notes, descriptions and illustrations of this new material. The types are deposited in the Museu Nacional at Rio de Janeiro (MNRJ) and in the Entomological Collection of the Departamento de Biologia, Universidade do Amazonas at Manaus, and the paratypes in the Nationaal Natuurhistorisch Museum at Leiden (RMNH). The key to the South-American representatives of *Phyllogomphoides* (Belle, 1984) has been modified to accept *P. joaquini* Rodrigues, 1992 (Rodrigues Capitulo, 1992), and the present new species. The illustrations are reproductions of drawings made by myself with the aid of a camera lucida (details completed by free hand) except for the pictures of the thoracic colour pattern which are diagrammatic. The measurements are in millimeters.

Descriptions

Phyllogomphoides calverti (Kirby, 1897) (figs 1, 2)

Cyclophylla calverti Kirby, 1897: 613.

Phyllogomphoides calverti; Belle, 1982b: 92.

Material.— Brazil: 1 ♂ (MNRJ), State of Pará, Belém (Utriega), 4.ii.1963, Mielke & Roppa leg.

The present male is the second one of this species that has been collected. The first capture was done in 1896 near Breves about 225 km west of Belém. Apparently *P. calverti* is a rare or difficult to collect species. Some notes on and figures of this second male may be added. Subtriangle in hind wings open and that of fore wings two-celled. Supratrangles and discoidal triangles two-celled in all wings. Nodal index 10:16-17:11/12:12-13:11. Thoracic colour pattern and caudal appendages shaped as shown in figures 1 and 2. The dimensions are: total length 53; abdomen 43 (incl app. 2.4); hind wing 39; costal edge of pterostigma in fore wing 4.

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

Phyllogomphoides praedatrix Belle, 1982
(figs 3-7)

Phyllogomphoides praedatrix Belle, 1982a: 3.

Material.— Brazil: 1 ♂ (RMNH), State of Rondônia, Cachoeira do Samuel, Rio Jamari mun. de Porto Velho - Guaporé, iii.1944, Parko leg.; 1 ♂ (MNRJ), (first described ♂), S. Proc.

This species was described from a single female specimen collected at Abuná in the State of Rondônia, Brazil by J.H. Williamson and J.W. Strohm. The present two males referable to this species were also collected in the same state but from the locality data it is not to say what is the exact place of capture. At Abuná, the Rio Guaporé is about 250 km remote from the Rio Jamari. The two males were stored in different triangular envelopes. Could one of them be collected at the Rio Jamari and the other at the Rio Guaropé?

When I described the species (Belle, 1982), I was convinced that it belongs to the *P. fuliginosus*-group basing my conclusion on the features exhibited by the female. But the anterior genital hamule of the corresponding male has not the complicated conformation that is typical of this group. Otherwise the present two males agree fairly well with the other characters of the *P. fuliginosus*-assemblage.

Male (first described ♂; an aged individual; tip of hind wings broken off).— Total length 62.5; abdomen 48 (incl. app. 3); hind wing 35; costal edge of pterostigma in fore wing 4.6.

Very similar to female holotype in stature and coloration but occipital plate yellow in middle part. Lamina tibialis of first tibia one-third of tibial length. Auricles yellow. Ventral tergal margins of abdominal segment 7 denticulated for nearly their whole length [in the males of the *fuliginosus* group without denticles or at the most with some denticles at the apex of the segment]. Yellow basal spot of abdominal segment 7 mainly developed on middorsal part. Accessory genitalia hairy and brown with the extreme inturned tips of the anterior and posterior hamules black. Cerci yellow, becoming blackish brown at base. Lateral dilatations of abdominal segment 8 very broad and leaf-like as in the female holotype. Accessory genitalia and caudal appendages shaped as shown in accompanying figures 3-7.

Wings brown tinged. Nodal index 15:23-22;13/15:17-17:16. Second primary antenodal cross-vein the seventh in left pair of wings and the sixth in right pair of wings. All supratrangles three-celled. Subtriangles and discoidal triangles in fore wings

four-celled. Subtriangle in hind wings three-celled with the dividing cross-veins tri-radiate from the centre. Discoidal triangle in hind wings four-celled (right) and three-celled (left). Anal loop in both hind wings two-celled.

The other male is also an aged individual and very similar to the first described one but the pterostigma in the fore wing is slightly longer (4.9 mm). The specimen is slightly damaged (tip of left fore wing broken away, pterothorax partly crushed). The differences in the venation of the wings are nodal index 15:21-20:16/15:16-14:16, second primary antenodal cross-vein the fifth in right hind wing, discoidal triangle in both hind wings three-celled, and anal loop in right hind wing three-celled with the dividing cross-veins tri-radiate from the centre.

Phyllogomphoides spiniventris spec. nov.
(figs 8-15)

Material.— Brazil: 1 ♀ (allotype), State of Goiás, Fazenda Olho d'Agua, Tora do Parque Nacional de Emas, 12.x.1982; 3 ♂ (holotype (MNRJ) and paratypes), 2 ♀ (paratypes), same locality, 15.x.1982; 2 ♂ (paratypes), Jatai, 12.x.1982; 1 ♀ (paratype), State of Mato Grosso, Chapada, 28.x.1983, all N. Santos et al. leg., MNRJ but one pair of paratypes in RMNH.

This species is distinct from all other species of *Phyllogomphoides* by the possession of a row of strong short spines along the ventral tergal margins of the seventh abdominal segment of the male (fig. 11). This extraordinary character suggested the specific name. The male cerci are long and each of them bears a strong, hatchet-shaped, inferior protuberance near the base (fig. 14); in a side view of the abdomen these cerci are almost parallel-sided. The wing venation of this species is rather dense. The colour pattern of the body, done in brown and (pale) yellow, is well-developed and the abdomen is handsomely annulated.

Male (holotype).— Total length 55; abdomen 42 (incl. app. 3); hind wing 33.5; costal edge of pterostigma in fore wing 4.6.

Pale colours of head, thorax and basal segments of abdomen pale yellow, of other abdominal segments yellow but of superior caudal appendages again pale yellow.

Head.— Face pale but slightly tinged with brown at depressed areas of postclypeus and along inferior margin of vertical part of frons. Superior surface of frons largely pale, brown tinged along basal margin. Vertex brown but pale on area posterior to ridge behind lateral ocelli; the low mound-like prominences of ocelli with rather long pale hairs. Occipital plate largely pale, its posterior ridge brown and fringed with pale hairs. Rear of head largely yellow on lateral sides and with a large central pale spot below occipital ridge; other parts brown to dark brown. Labium and adjacent mouth parts pale.

Thorax.— Prothorax dark brown, with a large pale spot on lateral sides. Pterothorax with well-developed colour pattern which is shaped as shown in diagram figure 8. First pale antehumeral stripes connected with the pale mesothoracic "half collar".

Legs.— Femora pale, the dorsal sides with longitudinal brown tinged stripes. Tibiae, tarsi and claws dark brown. Lamina tibialis of first tibiae about one-fifth the tibial length.

Wings.— Clear, slightly brown tinged at bases. Venation brown but frontal margin of costa yellow. Pterostigma dark brown. Basal subcostal cross-vein present. Nodal index 11:19-19:11/12:15-14:14. Second primary antenodal cross-vein the sixth in right hind wing, the seventh in other wings. Intermedian cross-veins 12-12/8-7. Supratriangle in all wings three-celled. Subtriangle in fore wings four-celled, in hind wings three-celled with the dividing cross-veins tri-radiate from centre. Discoidal triangle in fore wings four- and five-celled, in hind wings three-celled. Anal loop three-celled. Male anal triangle in hind wings four-celled.

Abdomen.— Segments dark brown with pale basal spots which are elongated on middorsum of segment, and with pale side spots on basal and end segments. Lateral dilatation of segment 8 well developed, pale and 0.5 mm wide. Lateral dilatations of segment 9 also pale and 0.3 mm wide, the basal half of the dilatations bent inward. Anterior genital hamule shaped as shown by figure 9; it is pale yellow with a black posterior hook. Posterior hamules yellow, brown at base, black at extreme tip. Outer lateral side of posterior hamule scattered with about eight small black denticles which are as large as the denticles along posterior border of auricles. Caudal appendages shaped as shown in figures 11-14. Cerci pale yellow but brown at base, at ventro-basal protuberance, along inturned subapical strip of upper margin, and at extreme upright apex, the latter acute and tufted with long pale bristles. Epiproct brown, the two slender branches widely spread apart.

Female (allotype; pterothorax partly damaged; abdomen broken between segments 5-6).— Total length 52; abdomen 40 (incl. app. 2.5); hind wing 35; costal edge of pterostigma in fore wing 4.8.

Similar to male holotype in stature and colouration. Ventral tergal margins of abdominal segments 2 to 7 armed with inconspicuous small black denticles. Lateral dilatations of abdominal segment 8 almost lacking. Length of abdominal segments 7, 8, 9 and 10 approximately in ratio 9:7:4:3, with the stylets 5 on the same scale. Vulvar lamina widely excised V-shaped for its distal three-fourths, the interval between the lobes 90°, the bottom of the excision somewhat rounded, the lobes, in ventral view, subtriangular with the outer lateral margin rounded off at base of vulvar lamina (fig. 10). Nodal index 11:21-22:12/13:15-15:12. Supratriangles three-celled. Subtriangles, discoidal triangles and anal loops three-celled with the dividing cross-veins tri-radiate from centre, except for subtriangle of left fore wing which is four-celled. Second anal interspace of hind wings filled with two rows of cells. Anal loop of hind wings three-celled with the dividing cross-veins tri-radiate from centre. Hind wings behind Cu₂ five cells wide.

Some paratypes show the following colour differences: anterior free border of labrum brown; vertex largely pale; occipital plate entirely pale; prothorax with a middorsal pale twin-spot; and posterior genital hamule only pale on outer side of tip.

The wing venational characters of the five males and four females were tabulated with the following result:

Fore wings.— Supratriangle: 3-celled, 100% of males, 75% of females; 2-celled, 25% of females. Subtriangle: 4-celled, 30% of males, 37½% of females; 3-celled, 30% of males, 37½% of females; 2-celled, 40% of males, 25% of females. Discoidal triangle: 4-celled, 20% of males; 3-celled, 70% of males, 100% of females; 2-celled, 10% of males.

Hind wings.— Supratrangles: 4-celled, 20% of males; 3-celled, 80% of males, 100% of females. Subtriangle: 3-celled, 70% of males, 87½% of females; 2-celled, 30% of males, 12½% of females. Discoidal triangle: 3-celled, 100% of males, 100% of females. Anal loop 3-celled, 70% of males, 75% of females; 2-celled, 30% of males, 25% of females. Second anal interspace in hind wing of female filled with two rows of cells in 75%; starting (at anal vein) with a single cell followed by two rows of cells in 25% of females.

The smallest specimen is a male with the dimensions: total length 50; abdomen 39; hind wing 30.5; costal edge of pterostigma in fore wing 4.2.

Phyllogomphoides suspectus spec. nov.
(figs 15-17)

Material.— Brazil: 1 ♂ (holotype (MNRJ)), State of Rondônia, Rio Ouro Preto, viii.1980, Santos leg.; 1 ♂ (very teneral; paratype), 1 ♀ (allotype), State of Mato Grosso, Sinop, x.1976, Braulio & Roppa leg. Holotype and allotype in MNRJ, paratype in RMNH.

This species is closely related to the preceding one but it is smaller and the ventral tergal margins of the seventh abdominal segment are armed with smaller (and therefore less conspicuous) spines. The cerci differ in having the upright apex bluntly pointed and pale, and the inferior apical angle produced backward (fig. 16). The anterior genital hamules are distinguished in not having a posterior black hook.

Male (holotype).— Total length 50; abdomen 38.5 (incl. app. 2.8); hind wing 28; costal edge of pterostigma in fore wing 3.7.

Compared with the preceding species the male of *Phyllogomphoides suspectus* differs (besides in the characters cited above) in the following points: face entirely pale except for a brown band along anterior free border of labrum; lateral dilatations of eighth abdominal segment 0.3 mm wide; anterior genital hamule excavated at apex, the lobe black (fig. 17).

Wings.— Colouration of venation and pterostigma as in *P. spiniventris*. Basal subcostal cross-vein present. Nodal index 11:20-18:11/12:14-13:12. Second primary antenodal cross-vein the sixth in right fore wing and left hind wing, the seventh in other wings. Intermedian cross-veins 10-11/7-6. Supratrangles in left hind wing three-celled, in other wings two-celled. Subtriangles and discoidal triangles three-celled with the dividing cross-veins tri-radiate from centre but subtriangle of right wings two-celled. Anal loop in hind wings three-celled. Male anal triangle of hind wings four-celled.

Female (allotype; three legs and hind wings broken off).— Total length 47; abdomen 36; hind wing 31; costal edge of pterostigma 4.0.

Similar in stature to male holotype but colouration darker and wing venation somewhat denser. First pale antehumeral stripe not connected with pale mesothoracic "half collar". Abdominal segments 8 and 9 largely brown, pale only along ventral tergal margins. Segment 10 entirely brown. Postclypeus brown with large pale side spots. Labrum brown in middle and along borders, the black band along the free border well-developed. Superior surface of frons brown for its median one-third portion. Abdominal segments 8 and 9 laterally not dilated. Lengths of abdominal seg-

ments 7, 8, 9, and 10 approximately in ratio 21:13:8:5, with the stylets 10 on the same scale. Vulvar lamina deeply excised V-shaped for its distal three-fourths, the interval between the lobes about 70°, the lobes triangular in ventral view (fig. 15). Nodal index 12:19-20:12/11:15-16:12. Second primary antenodal cross-vein the seventh in left wings, the eighth in right wings. Intermedian cross-veins 12-12/8-8. Supratrangles three-celled. Subtriangles and discoidal triangles three-celled with the dividing cross-veins tri-radiate from centre except for subtriangle of left fore which has two dividing cross-veins. Second anal interspace of hind wings filled with two rows of cells. Anal loop of hind wings two-celled (left) and three-celled (right), the latter with the dividing cross-veins tri-radiate from centre. Hind wings behind Cu2 five cells wide.

The male paratype is very teneral and much broken but the critical parts are in good condition; the colouration as far as developed is the same as in the holotype. The characters of the wing venation are: Nodal index 10:18-18:11/10:13-15:12. Intermedians cross-veins 9-11/7-8. Supratriangle two-celled in left fore wing and right hind wing, three-celled in other wings. Subtriangle in right fore wing two-celled, in all other subtriangles and discoidal triangles three-celled with the dividing cross-veins tri-radiate from centre. Anal loop three-celled with the dividing cross-veins tri-radiate from centre. Male anal triangle of hind wing four-celled.

Phyllogomphoides pseudangularis spec. nov.
(figs 18-20)

Material.— Brazil: 1 ♀ (allotype) State of Amazonas: Rio Urucu, Coari (4° 51' 56.6" S, 65° 04' 56.6" W), 11-18.v.1991, P. Burnheim, N.O. Aguiar & F.A. Fé; 1 ♂ (holotype), same locality, 14-24.v.1993, P.F. Burnheim et al leg. Holotype and allotype in the Entomological Collection of the Departamento de Biologia, Universidade do Amazonas, Manaus.

This species is closely related to *Phyllogomphoides angularis* Belle, 1982, but the male is at a glance distinguished from it in having the lateral dilatations of the eighth and ninth abdominal segments much better developed, those of the ninth segment being moreover nearly twice as wide as those of the eighth segment (fig. 18). The cerci are very similar in conformation to those of *P. angularis*.

Male (holotype; abdomen broken between segments 3 and 4).— Total length 53; abdomen 42 (incl. app. 2); hind wing 30; costal edge of pterostigma in fore wing 3.5.

Compared with *P. angularis*, the present male differs (besides in the character cited above) in the following points pale colours of head greenish yellow; occipital plate with a pale central spot; metepisternal stripe more strongly constricted near subalar carina; femora brown but inner side of first femora green; anterior genital hamules with broader and more swollen base, the posterior hook more prominent and somewhat longer; epiproct more widely excised V-shaped and with longer lobes (fig. 19).

Wings.— With slight brown tinge. Venation blackish brown including frontal margin of costa. Pterostigma brown, surmounting 6 cells. Nodal index 12:16-17:11/10:14-13:11. Intermedian cross-veins 10-10/5-6. Subtriangle in hind wings

open. Discoidal triangle in left fore wing three-celled with the dividing cross-veins tri-radiate from centre. Other discoidal triangles as well as subtriangles in fore wings and all supratrangles two-celled. Anal loop in right hind wing two-celled, in left hind wing three-celled with the dividing cross-veins tri-radiate from centre. Three rows of cells behind Cu2 of hind wings but right hind wing with an extra cell for a fourth row.

Female (allotype; coloration somewhat obscured; left fore wing broken off; abdomen broken between segments 2-3 and 4-5).— Total length 49.5; abdomen 38.5 (incl. app. 1.5); hind wing 30.5; costal edge of pterostigma in fore wing 3.8.

Similar in stature to male holotype but pale markings less pronounced. Occipital plate without a pale central spot. Lateral dilatations of segments 8 and 9 narrow but also black. Hind margin of vulvar lamina widely excised almost semicircular, the lobes, in ventral view, subtriangular with strongly rounded tip (fig. 20). Relative lengths of abdominal segments 7, 8, 9, 10 approximately in ratio 45:27:15:10, with the stylets 15 on the same scale.

Wings.— Clear but extreme bases with brown tinge. Nodal index 12:19-20:13/12:14-15:13. Intermedian cross-veins 8-9/7-7. Supratrangles and subtriangles two-celled. Discoidal triangle in fore wings three-celled with the dividing cross-veins tri-radiate from centre, in hind wings two-celled. Anal loop in hind wings three-celled with the dividing cross-veins tri-radiate from centre. Second anal interspace of hind wings starting with a row of single cells, two cells long, followed by two rows of cells, two cells long. Hind wings behind Cu2 four cells wide.

Key to the South-American species of *Phyllogomphoides*

Males

(The males of *P. audax* and *P. cornutifrons* are unknown)

1. Anterior hamules conch-shaped *P. singularis* Belle
- Anterior hamules of other structure 2
2. Cerci, in dorsal view, tweezers-shaped; each cercus more or less straight over whole length but very slightly curving inward near apex 3
- Cerci, in dorsal view, more or less forcipate; each cercus distinctly curving inward 6
3. Pale mesothoracic "half collar" and second pale antehumeral stripe absent or vestigial *P. andromeda* (Selys)
- These pale stripes well-developed 4
4. First and second pale antehumeral stripes broadly confluent with pale mesothoracic "half collar". Posterior genital hamule elongated to rearward and extending to well above seminal vesicle *P. joaquina* Rodrigues
- Second pale antehumeral stripe not connected with the pale mesothoracic "half collar". Posterior genital hamule extending to a point well before vesicle 5
5. Face green with a black band along free border of labrum *P. cassiopeia* (Belle)
- Face black with green markings on clypeus and labrum *P. cepheus* Belle
6. Anterior genital hamules of very complicated form, with bulbous frontal part, lateral leaf-like expansion, and backwardly elongated apex 7

- Anterior genital hamules of more simple structure 10
- 7. Epiproct very short and deeply excised V-shaped *P. major* Belle
- Epiproct about half as long as superiors and divided shortly beyond its base into two branches 8
- 8. Second pale antehumeral stripes and pale metepisternal stripes absent or vestigial *P. imperator* Belle
- These stripes well-defined 9
- 9. Large species; hind wing 42 mm. Pale basal marking of abdominal segment 7 covering far more than one-third of the segment *P. selysi* (Navás)
- Smaller species; hind wing 36-37 mm. Pale basal marking of abdominal segment 7 covering one-third of the segment *P. fuliginosus* (Hagen)
- 10. Cerci with a strong acute inferior tooth at one-third or two-fifths length 11
- Cerci without such a tooth 13
- 11. Pale basal colour of abdominal segment 7 interrupted middorsally, and therefore divided into spots. Lateral dilatations of segment 8 narrow and parallel-sided on apical half of segment *P. calverti* (Kirby)
- Pale basal colour of abdominal segment 7 not interrupted middorsally, and therefore not divided into spots. Lateral dilatations of abdominal segment 8 leaf-like and strongly convex on apical half of segment 12
- 12. Second pale antehumeral stripe well-developed. Lateral dilatations of segment 8 broadly widening to rearward and extending to one-fourth the length of segment 9. Cerci with a subapical, downwardly directed internal lobe *P. praedatrix* Belle
- No second pale antehumeral stripe. Lateral dilatations slightly widening to rearward and not or slightly extending beyond base of segment 9. Cerci with a superior tooth or tubercle at two-thirds length *P. camposi* (Calvert)
- 13. Cerci with a strong, hatchet-shaped inferior protuberance near the base 14
- Cerci without such a protuberance 15
- 14. Large species; hind wing > 30 mm. Ventral tergal margins of abdominal segment 7 with a conspicuous row of strong spines which are predominantly yellow on their basal half and black on their apical half. Extreme upright tip of cerci acute and brown *P. spiniventris* spec. nov.
- Smaller species; hind wing < 30 mm. Spines along ventral tergal margins of abdominal segment 7 small and largely black. Extreme upright tip of cerci blunt and pale *P. suspectus* spec. nov.
- 15. Cerci with a long, finger-like, downwardly directed inferior spine near base 16
- Cerci without inferior spine of any kind or with a small inferior spine or tooth near base 22
- 16. Cerci strongly turning downward to tip, apex obtuse 17
- Cerci not turning downward to tip, apex acute 18
- 17. Length of penial flagella half the length of abdominal segment 3. First pale antehumeral stripe broadly confluent with pale mesothoracic "half collar" *P. pseudoundulatus* Belle
- Length of penial flagella two-thirds the length of abdominal segment 3. First pale antehumeral stripe isolated *P. undulatus* (Needham)
- 18. Anterior hamules with an acute posterior hook. Subtriangle in hind wings uncrossed 19

- Anterior hamules with a posterior excision. Subtriangle in hind wings crossed ... 21
- 19. Seminal vesicle (penial peduncle) slender and excessively elongated, being about half the length of abdominal segment 2 *P. pedunculus* Belle
- Seminal vesicle shorter, being about one-third the length of second abdominal segment 20
- 20. Lateral dilatations of abdominal segments 8 and 9 narrow and of equal width *P. angularis* Belle
- Lateral dilatations of abdominal segments 8 and 9 rather well developed, the lateral dilatations of segment 9 being nearly twice as wide as the ones of segment 8 *P. pseudangularis* spec. nov.
- 21. Cerci with a superior tooth at about two-thirds the length *P. atlanticus* (Belle)
- Cerci without superior tooth *P. aculeus* Belle
- 22. Epiproct well developed and divided shortly beyond its base into two branches 23
- Epiproct very short and posteriorly excised more or less V-shaped 24
- 23. Penial flagella distinctly shorter than penultimate segment of penis. Epiproct with bottom of excision as wide as length of either branche *P. regularis* (Selys)
- Penial flagella about as long as penultimate segment of penis. Epiproct with the length of either branche one and a half times the width of bottom of excision *P. annectens* (Selys)
- 24. Cerci with a superior tooth at two-thirds the length 25
- Cerci without superior tooth *P. cristatus* (Needham)
- 25. Anterior hamules notched at inner margin *P. semicircularis* (Selys)
- Anterior hamules notched at posterior margin 26
- 26. Labrum with a pair of pale spots *P. lieftincki* (Belle)
- Labrum entirely brown *P. brunneus* Belle

Females

(The females of *P. aculeus*, *P. angularis*, *P. atlanticus*, *P. calverti*, *P. camposi*, *P. pedunculus*, *P. pseudoundulatus* and *P. singularis* are unknown)

- 1. Frons with a pair of large horns *P. cornutifrons* (Needham)
- Frons without horns 2
- 2. Pale mesothoracic "half collar" absent. First pale antehumeral stripe more or less pear-shaped oblong *P. andromeda* (Selys)
- Pale mesothoracic "half collar" present. First pale antehumeral stripe of different shape 3
- 3. Abdominal segment 8 with distinct lateral dilatations 4
- Abdominal segment 8 without or with no evident lateral dilatations 13
- 4. Width of lateral dilatations of abdominal segment 8 a quarter the middorsal length of segment 8 or wider 5
- Width of lateral dilatations of abdominal segment 8 one-sixth the middorsal length of segment 8 or narrower 10
- 5. Second pale antehumeral stripe and pale metepisternal stripe present 6
- These stripes undeveloped and vestigial *P. imperator* Belle
- 6. Labrum largely pale but with a black band along free border

- *P. cassiopeia* (Belle)
- Labrum with a pair of pale spots 7
7. Vulvar lamina very widely excised; the excision more or less semicircular; the lobes rather narrow and bluntly tipped *P. praedatrix* Belle
- Vulvar lamina not very widely excised; the lobes broad 8
8. Pterostigma 6-7 mm long. Excision of vulvar lamina more or less U-shaped. Width of lateral dilatations of abdominal segment 8 nearly half the middorsal length of this segment *P. major* Belle
- Pterostigma 5-6 mm. Excision of vulvar lamina more or less V-shaped. Width of lateral dilatations of abdominal segment 8 about one-third the middorsal length of this segment 9
9. Large species; hind wing 43 mm. Lobes of vulvar lamina with projecting postero-lateral corners *P. selysi* (Navás)
- Smaller species; hind wing 37-38 mm. Lobes of vulvar lamina with round postero-lateral corners *P. fuliginosus* (Hagen)
10. Large species; hind wing 43 mm. Vulvar lamina relatively small, its width about one-third the width of ninth sternite *P. audax* (Hagen)
- Smaller species. Vulvar lamina relatively wider 11
11. Lateral dilatations of abdominal segment 8 and 9 equal in width. Prothorax with pale middorsal twin-spot *P. undulatus* (Needham)
- Lateral dilatations of abdominal segment 8 twice as wide as those of abdominal segment 9 or wider. Prothorax without pale middorsal twin-spot 12
12. Lobes of vulvar lamina broadly rounded *P. fuliginosus* (Hagen)
- Lobes of vulvar lamina subtriangular *P. cepheus* Belle
13. Lobes of vulvar lamina broadly rounded 14
- Lobes of vulvar lamina (sub-)triangular 15
14. Face greenish with brown on anteclypeus and along free border of labrum. Frontal margin of costa entirely brown. Subtriangle of hind wings one-celled *P. annectens* (Selys)
- Face yellow sometimes with brownish markings but with pale green anteclypeus. Frontal margin of costa with a yellow line. Subtriangle of hind wings one-celled or two-celled *P. regularis* (Selys)
15. Labrum black along free border *P. cristatus* (Needham)
- Labrum brown, green or pale along anterior side of free border 16
16. Labrum entirely (reddish) brown 17
- Labrum pale, largely pale or brown with pale markings 18
17. Prothorax with entirely black dorsum. Vulvar lamina excised V-shaped for two-thirds its length *P. semicircularis* (Selys)
- Prothorax with a pale middorsal twin-spot. Vulvar lamina excised V-shaped for three-quarters its length *P. brunneus* Belle
18. Labrum pale along free border *P. spiniventris* spec. nov.
- Labrum brown along anterior side of free border 18
19. Labrum brown with pale lateral sides. Subtriangle of hind wings open. Second anal interspace of hind wings starting (at anal vein) with a single row of cells, two cells long, followed by two row of cells, two cells long *P. pseudangularis* spec. nov.

- Labium with a pair of pale spots. Subtriangle in hind wings made up of one to three cells. Second anal interspace starting (at anal vein) with two rows of cells 20
- 20. Subtriangle of hind wings normally three-celled, sometimes two-celled. Lobes of vulvar lamina sharply angular at tip *P. suspectus* spec. nov.
- Subtriangle of hind wings normally two-celled, sometimes one-celled. Lobes of vulvar lamina bluntly rounded at tip *P. lieftincki* Belle

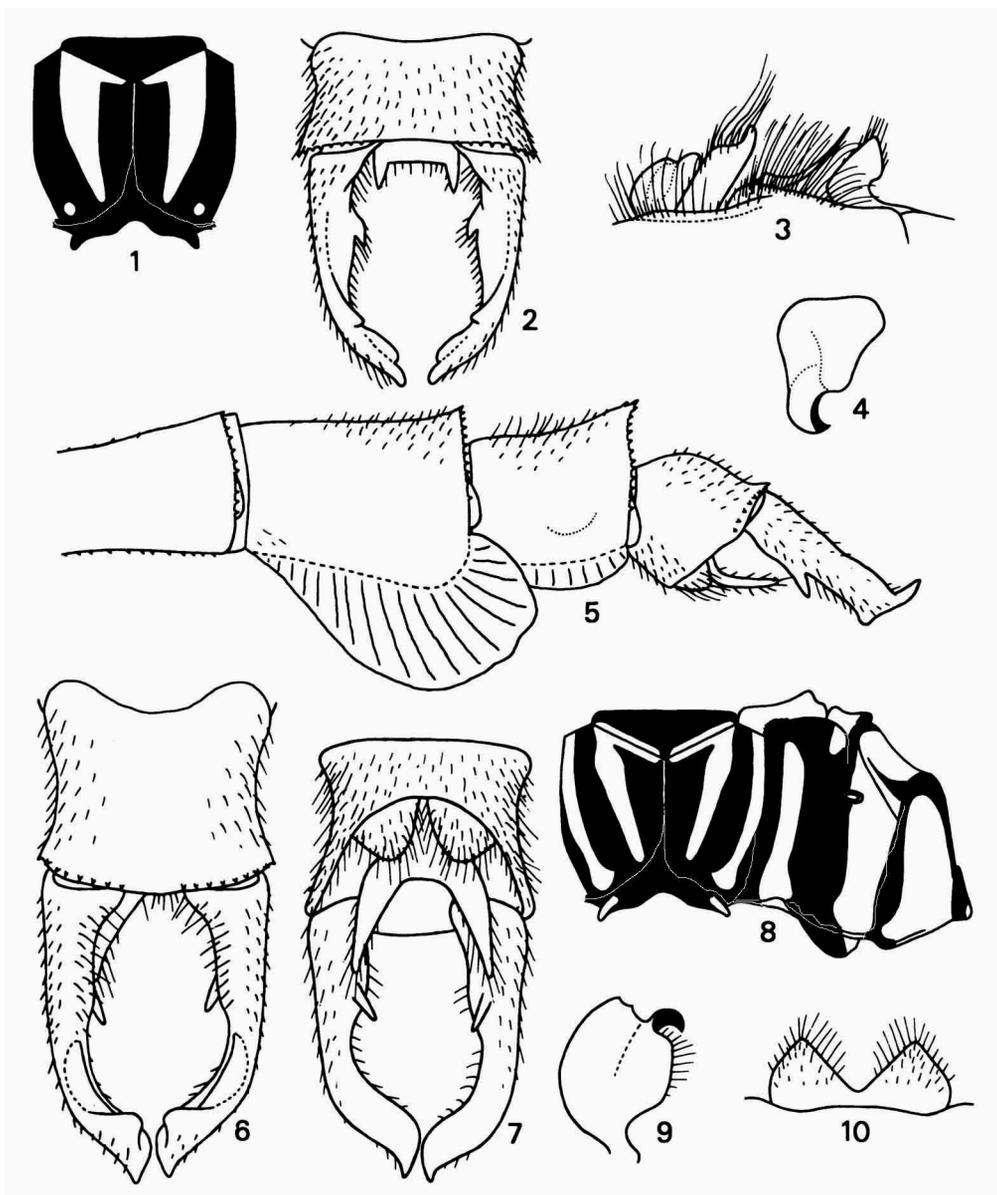
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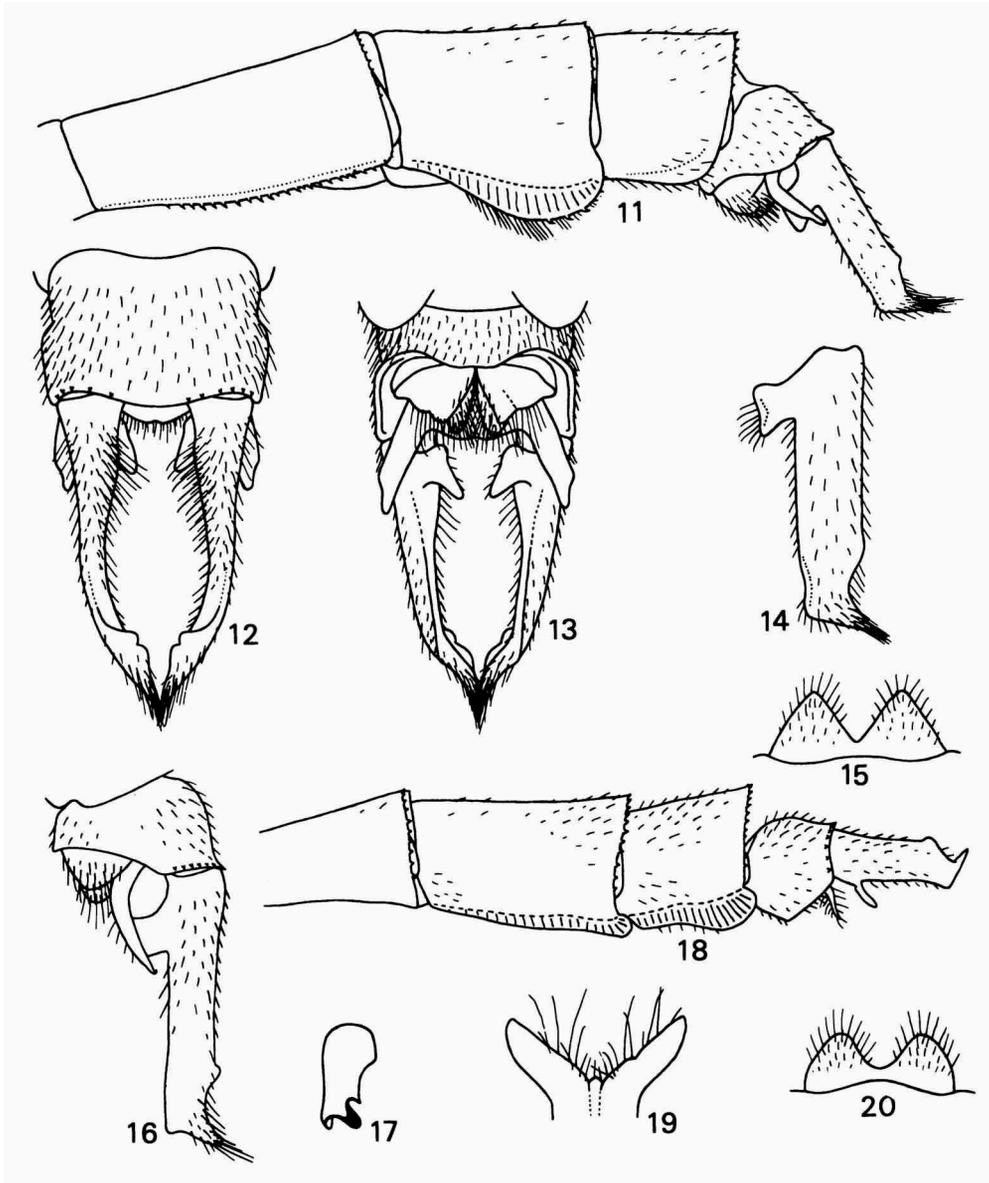
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Figs 1-2, *Phyllogomphoides calverti* (Kirby), ♂: 1, diagram of colour pattern of pterothoracic dorsum; 2, tenth abdominal segment and caudal appendages, dorsal view. Figs 3-7, *Phyllogomphoides preaedatrix* Belle, first described ♂: 3, accessory genitalia, left lateral view; 4, anterior genital hamule, ventral view; 5, apical segments of abdomen and caudal appendages, left lateral view; 6, tenth abdominal segment and caudal appendages, dorsal view; 7, the same, ventral view. Figs 8-10, *Phyllogomphoides spiniventris* spec. nov.: 8, diagram of pterothoracic colour pattern of ♂ holotype; 9, right anterior genital hamule of ♂ holotype, right lateral view; 10, vulvar lamina of ♀ allotype, ventral view.



Figs 11-14, *Phyllogomphoides spiniventris* spec. nov.: 11, apical segments of abdomen and caudal appendages of ♂ holotype, left lateral view; 12, tenth abdominal segment and caudal appendages of ♂ holotype, dorsal view; 13, the same, ventral view; 14, left cercus of ♂ paratype, left lateral view, showing ventro-basal protuberance. Figs 15-17, *Phyllogomphoides suspectus* spec. nov.: 15, vulvar lamina of ♀ allotype, ventral view; 16, tenth abdominal segment and caudal appendages of ♂ holotype, left lateral view; 17, anterior genital hamule of ♂ holotype, ventral view. Figs 18-20, *Phyllogomphoides pseudangularis* spec. nov.: 18, apical segments of abdomen and caudal appendages of ♂ holotype, left lateral view; 19, epiproct of ♂ holotype, dorsal view; 20, vulvar lamina of ♀ allotype, ventral view.