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A contribution to the knowledge of the caddisfly fauna of New Guinea [Trichoptera]

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Keywords: adult caddisflies, Papua (Indonesia), new species, male genitalia morphology.

Study of a small collection of adult Trichoptera sampled by light mostly in central eastern Indonesian Papua (Jayawijaya Mountains) has lead, essentially, to description of eight new species in the genera *Agapetus, Cheumatopsyche, Hydropsyche, Triaenodes*, and *Oecetis*; several other species, already known from New Guinea, have been rediscovered.

Contribution à la connaissance de la faune des Trichoptères de Nouvelle Guinée [Trichoptera]

Mots-clés : Trichoptères adultes, Papua (Indonésie), espèces nouvelles, morphologie des genitalia mâles.

L'étude d'une petite collection de Trichoptères adultes capturés à la lumière surtout dans la partie centrale orientale – montagnes Jayawijaya – de Papua (Indonésie) a permis essentiellement la description de huit espèces nouvelles dans les genres *Agapetus, Cheumatopsyche, Hydropsyche, Triaenodes*, et *Oecetis*. D'autre part, plusieurs espèces, déjà connues de Nouvelle Guinée, ont été redécouvertes.

Introduction

During recent years small numbers of adult-caddisflies from Indonesian Papua were sampled as by-product of sampling of Lepidoptera by Dutch entomologists. This has made possible the publications by BOTOSANEANU & DE VOS (2004, 2006). During surveys in 2005 and 2008 more specimens were sampled by light mainly from the Jayawijaya Mountains in eastern Indonesian Papua, one sampling point having been in the Supiori Island, offshore the northern coast of Papua; they make the object of the present paper, filling a few gaps in the knowledge of the interesting and highly endemic trichopteran fauna of New Guinea, still very imperfectly known despite efforts of several generations of entomologists.

The sampling localities are:

1) Kab. Yahukimo, district Nipsan: Walmak, 1710 m. alt., 4° 07' S – 138° 36' E, 31.I.-16.II.2005, and, respectively, 24.-29.X.2008 (leg. R. de Vos & P.J. Zumkehr).

2) Kab. Yahukimo, district Kangguruk: Lelambo, 900m. alt., 4° 01' S – 139° 47' E, 24.-26.X.2008 (leg. P.J. Zumkehr).

3) Supiori Island, Kab. Supiori Utara: Nansfori, sea level, 0° 41' S – 135° 40' E (leg. R. de Vos & P.J. Zumkehr).

Further on the information about the localities will be abridged.

During study of this small collection eight species were recognized as new and will be here described. Only males have been used for the descriptions. All specimens are in alcohol; for the time being they are kept in the Zoological Museum of the University of Amsterdam (Entomology).

Besides the new species, several already described from New Guinea could be identified and are kept in the same collection. They are as follows:

- *Agapetus ulmeri* Ross, 1951:
Walmak, 31.I.-16.II.2005: 1 male; Walmak, 24-29.X.2008: 1 male.

- *Cheumatopsyche beroni* Kumanski, 1979:
Walmak, 24.-29.X.2008: 1 male.

- *Hydropsyche flynni* Korboot, 1964:
Walmak, 24.-29.X.2008: 1 male.

- *Polycentropus mounthageni* Kumanski, 1979:
Lelambo, 24.-26.X.2008: 1 male.

- *Oecetis marginata* Kimmins, 1962:
Lelambo, 24.-26.X.2008: 2 males.

Description of the new species

Family GLOSSOSOMATIDAE

Agapetus inflatigonus n. sp.

Male holotype: Walmak 24.-29.X.2008. Male paratype: Walmak 21.I.-16.II.2008.

Plate I, Figures 1-4.

Forewing length: 3.8 mm. Segment IX in lateral view massive in its lower parts, dorsal part much less massive but its length not much reduced. Superior appendages elongate with almost parallel margins and blunt apex. Tenth segment massive, for a good deal membranous, very strongly narrowed in its distal part and ending in a pair of strong acute hooks with tips directed anteriad.

Inferior appendages strongly inflated in lateral view; in ventral view widely diverging from their root, distally with row of three teeth along internal margin, followed by a blunt apical part. Phallus distally with three internal diversely shaped “spines”, and with odd looking apex.

There are already 5 species of *Agapetus* known from New Guinea (NEBOISS 1986). *A. inflatigonus* n. sp. resembles in several details of the male genitalia *A. apalapsili* (Malicky, 1978) but will be easily distinguished from it by the shape of the IXth segment, and especially by that of the gonopods which are completely different. When a comparison will become possible, differences will be perhaps found also in the phallic structures (internal spines, apex).

The specific name alludes to the characteristic shape of the gonopods in lateral view.

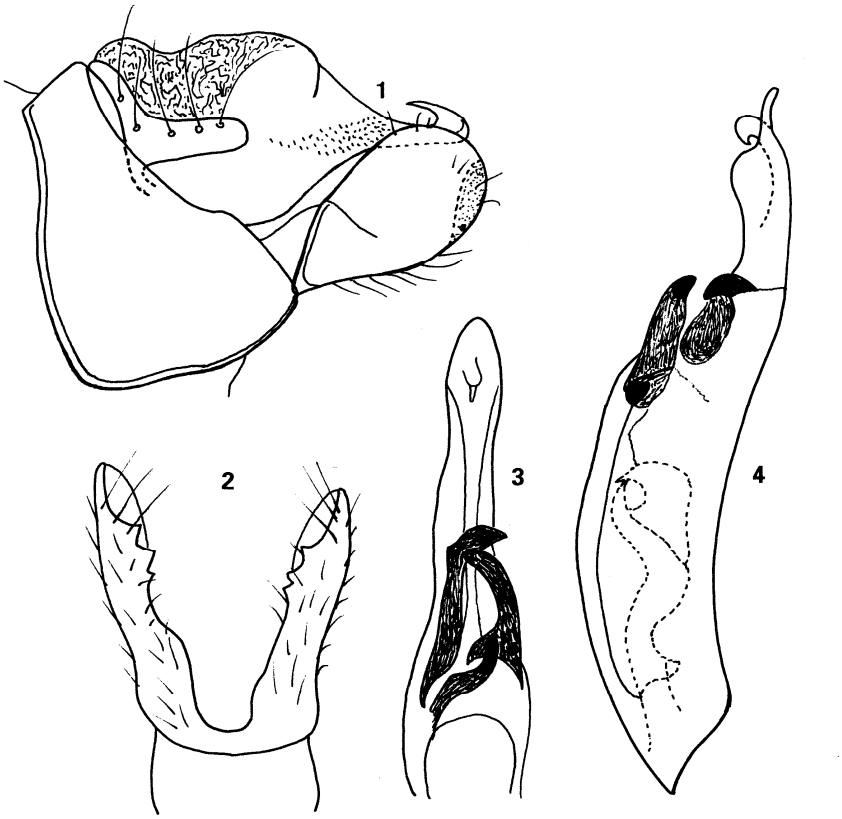

Plate I: Figures 1-4. *Agapetus inflatigonus* n. sp. Male genitalia. 1: lateral. 2: gonopods, ventral. 3: distal parts of phallus, ventral. 4: phallus, lateral (Figures 3 and 4: more strongly magnified).

Planche I : Figures 1-4. *Agapetus inflatigonus* n. sp. Genitalia mâles. 1 : vue latérale. 2 : gonopodes, vue ventrale. 3 : parties distales du phallus, vue ventrale. 4 : phallus, vue latérale (Figures 3 et 4 : plus fort grossissement).

Family HYDROPSYCHIDAE

Cheumatopsyche lelamba n. sp.

Male holotype: Lelambo 24.-26.X.2008.

Plate II, Figures 5-8.

Forewing length: 6.6 mm. Claws of foreleg normal. Terminology for the male genitalia mostly from OLÁH, JOHANSON & BARNARD (2008).

Segment IX in lateral view with ventrum strongly protruding anteriad, “dorsocaudal spiny lobe” well developed. The “smooth mesocaudal lobe” of segment X (dorsal view) looking like a small bud incomplete split apically. Segment X with distal margin distinctly emarginate, the

resulting dorsal lobe very setose, ventral lobe only with small setae; no lateral setose area; the apicoventral setal lobe short and rounded.

Coxopodites slightly meandering in their distal part; harpagones short, broad, blunt apices turning to the median line. Phallotheca relatively slender in its basal ascending part, then moderately inflated ventrad in its horizontal distal parts.

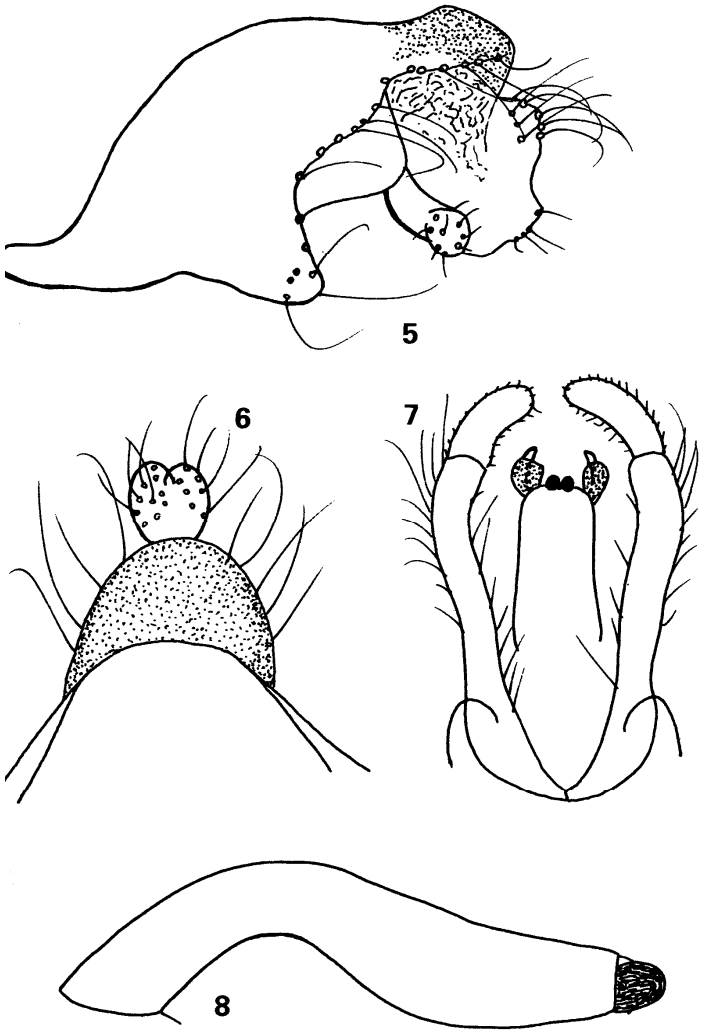

Plate II: Figures 5-8. *Cheumatopsyche lelamba* n. sp. Male genitalia. 5: lateral. 6: segments IX and X, dorsal. 7: gonopods and distal part of phallus, ventral. 8: phallus, lateral.

Planche II : Figures 5-8. *Cheumatopsyche lelamba* n. sp. Genitalia mâles. 5 : vue latérale. 6 : segments IX et X, vue dorsale. 7 : gonopodes et partie distale du phallus, vue ventrale. 8 : phallus, vue latérale.

This new species is clearly distinct from all four New Guinean species described to this day (two of them originally placed in *Hydropsychodes* Ulmer). I am not sure if it can be placed in one of the 15 species-groups proposed by OLÁH, JOHANSON & BARNARD (2008).

Hydropsyche walmaka n. sp.

Male holotype: Walmak, 24.-29.X.2008.

Plate III, Figures 9-13.

Forewing length: 9.5 mm. Foreleg-claws: Figure 9. In lateral view the saddle-like depression of the massive segment X is large and deep, roughly semicircular in outline, the upright part of the segment having a small but distinct notch at its tip; the spinulose zone, latero-ventrally developed, is large, irregular in outline, and protrudes distally in a rather large, blunt lobe. In dorsal view the median keel of segment IX is a sharply pointed triangle, and the apical excision of segment X is rounded. Coxopodites slender; harpagones slightly meandering, of regular shape, blunt ending. Phallus strongly winding, distal half of phallotheca very strongly protruding ventrad, with large shell-like endothecal processes and relatively large angular phallotremal sclerites (black in Figure 12).

From about one dozen of *Hydropsyche* species recorded to this day from New Guinea, the following (belonging to the entirely New Guinean "*ungulata*-group": see OLÁH & JOHANSON 2008: 156) are clearly related to the new species here described: *sabronensis* (Kimmins, 1962), *excavata* (Kimmins, 1962), and *carolae* Oláh & Johanson, 2008 (the first two originally described in the – at present synonymised – genus *Herbertorossia* Ulmer). From these three species *H. walmaka* n. sp. will be distinguished, i.a., by the more massive segment X, by the vast semicircular depression of segment X, by the apico-dorsal notch of the upright part of segment X (lateral view), by the even more strongly winding and inflated phallotheca, and by the proportionally longer, regularly shaped harpagones.

Hydropsyche neboissi n. sp.

Male holotype: Lelambo, 24.-26.X.2008.

Plate IV, Figures 14-17.

Forewing length: 8.8 mm. Claws of foreleg like in *H. walmaka*. In dorsal view the median keel of segment IX is broadly triangular, laterally with about six huge setae, and with tip slightly notched. The depression of segment X (lateral view) is relatively narrow, obliquely directed; the segment is a massive block divided in two lobes by a rather deep emargination; upper-larger-lobe finely spinulose at its apex, the apices of the two upper lobes looking in dorsal view like spinulose oval areas ("apicodorsal setose lobes"); the lower lobe is like an expansion of the vast lateral spinulose area (in dorsal view the spinulose areas appear rounded). Coxopodites slender at base but rather strong in most of their length; harpagones of moderate length, turned dorsad and mediad, tips blunt. The phallus has a curious shape: a short "root" of the phallotheca is followed by a horizontal segment followed by a short one strongly protruding ventrad; anteapically the phallotheca is clearly strangled; large shell-like endothecal processes, and large rounded phallotremal sclerites.

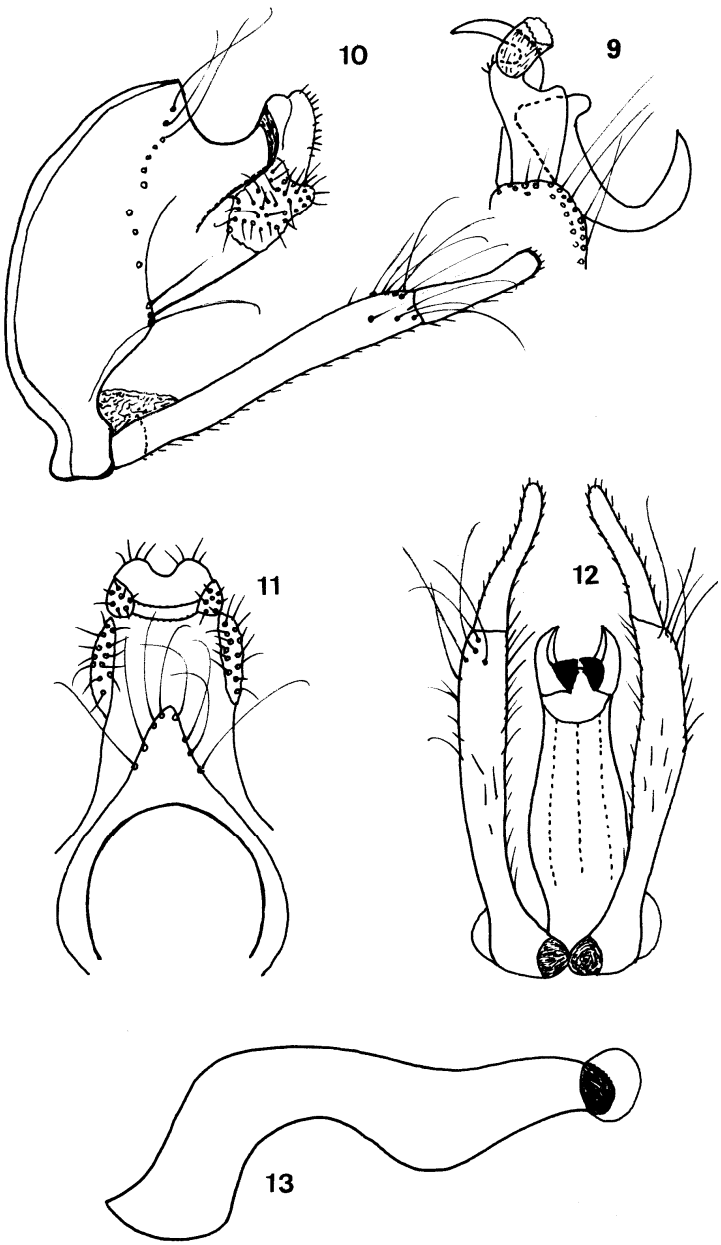

Plate III: Figures 9-13. *Hydropsyche walmaka* n. sp. 9: foreleg claws. 10-13: male genitalia. 10: lateral. 11: dorsal (more strongly magnified). 12: ventral. 13: phallus, lateral.

Planche III: Figures 9-13. *Hydropsyche walmaka* n. sp. 9: griffes de la patte antérieure. 10-13: genitalia mâles. 10: vue latérale. 11: vue dorsale (plus fortement grossie). 12: vue ventrale. 13: phallus, vue latérale.

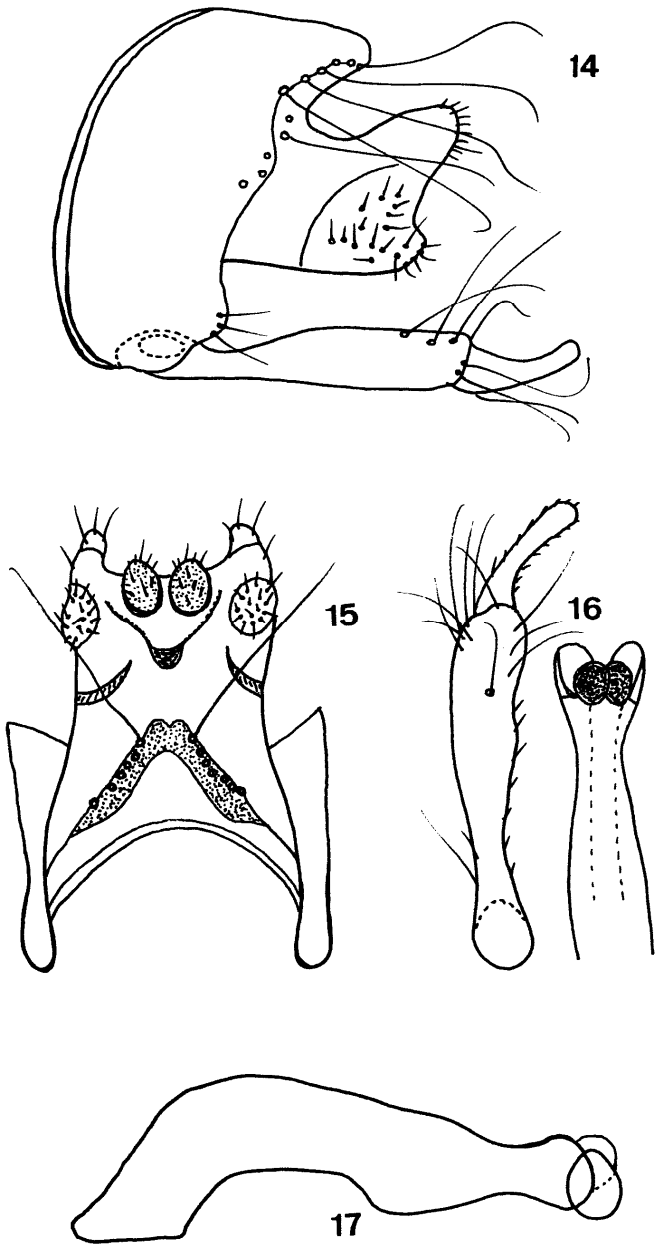

Plate IV: Figures 14-17. *Hydropsyche neboissi* n. sp. Male genitalia. 14: lateral. 15: dorsal (more strongly magnified). 16: gonopod and distal part of phallus, ventral. 17: phallus lateral.

Planche IV : Figures 14-17. *Hydropsyche neboissi* n. sp. Genitalia mâles. 14 : vue latérale. 15 : vue dorsale (plus fortement grossie). 16 : gonopode et partie distale du phallus, vue ventrale. 17 : phallus, vue latérale.

This species belongs to the same species-group as *H. walmaka* n. sp. and is clearly related to the New Guinean *sabronensis* (Kimmins, 1962), *excavata* (Kimmins, 1962), and *carolae* Oláh & Johanson, 2008. It will be easily distinguished from the related species by numerous structural details of segment IX, segment X, of the gonopods and of the phallus. The species is named in homage to Dr. Arturs Neboiss in recognition of his major contribution to the knowledge of the caddisfly fauna of the SW Pacific-Australian region.

Hydropsyche trirostrata n. sp.

Male holotype and male paratype: Supiori Island, Nansfori, 16.-19.X.2008.

Plate V, Figures 18-21.

Forewing length: 8 mm. Segment IX in lateral view broadly and regularly rounded, its ventrum strongly protruding. Intersegmental limit IX/X in dorsal view sharply distinct, trilobed, the median lobe strongly protruding dorsad in lateral view. Segment X horizontally developed, relatively slender, and showing along its dorsal border a characteristical succession of three humps followed apically by a sharp beak upright directed; latero-ventral spinulose zones anteapically placed, not very large. Coxopodites slender basally, then moderately broadened. The very small harpagones have a characteristical shape: they are directed mediad, their inner border is emarginate, and they end in a minute blackened point. Phallotheca well curved basally, then horizontally developed, anteapically with a distinct beak directed ventrad; endothecal processes large, cup-like with oblique apical opening; phallotremal sclerites small, spherical, apparently attached to the inner angle of the endothecal processes.

This is a well characterized species which, according to Dr. W. Mey (in litteris) should belong to genus *Herbertorossia* Ulmer, being possibly close to *H. rapsoni* Korboot, 1964. *Herbertorossia* has been synonymised with *Hydropsyche* in OLÁH & JOHANSON (2008); I am not sure that this is really justified, but, not being able to formulate clear arguments for this opinion I accept this synonymy for the present publication.

The specific name alludes to the “beaks” at the apices of segment X, gonopods, and phallotheca.

Family LEPTOCERIDAE

Triaenodes tortuosa n. sp.

Male holotype: Walmak, 24.-29.X.2008.

Plate VI, Figures 22-25.

Forewing length: 7.8 mm. Forewing very pale, but with patches of brownish setae on its apical zone and especially on the postcostal part of this zone.

In lateral view segment IX dorsum has an irregular (angular) distal margin; the dorsum is triangular in dorsal view. Below the relatively short superior appendages, and like them belonging to segment IX, a pair of long and slender appendages whose apical part turns down in a right angle; in dorsal view these appendages are twisted, ending in hooks roughly directed mediad. Segment X represented mainly by a pair of sclerotized appendages which are, in dorsal view, strongly curved mediad and then laterad, contiguous in their middle, and ending slightly twisted. The inferior appendages are very complex; there is a nuclear part whose two halves (ventral

view) are separated by a rather wide cleft, each ending in a strong bundle of stiff setae; from this "nuclear part", and upright directed, we find proximally a slender appendage with distal part curving downwards and with a distinct heel, and more distally a stronger one with broad and blunt apex, and with a small setose bump from its base.

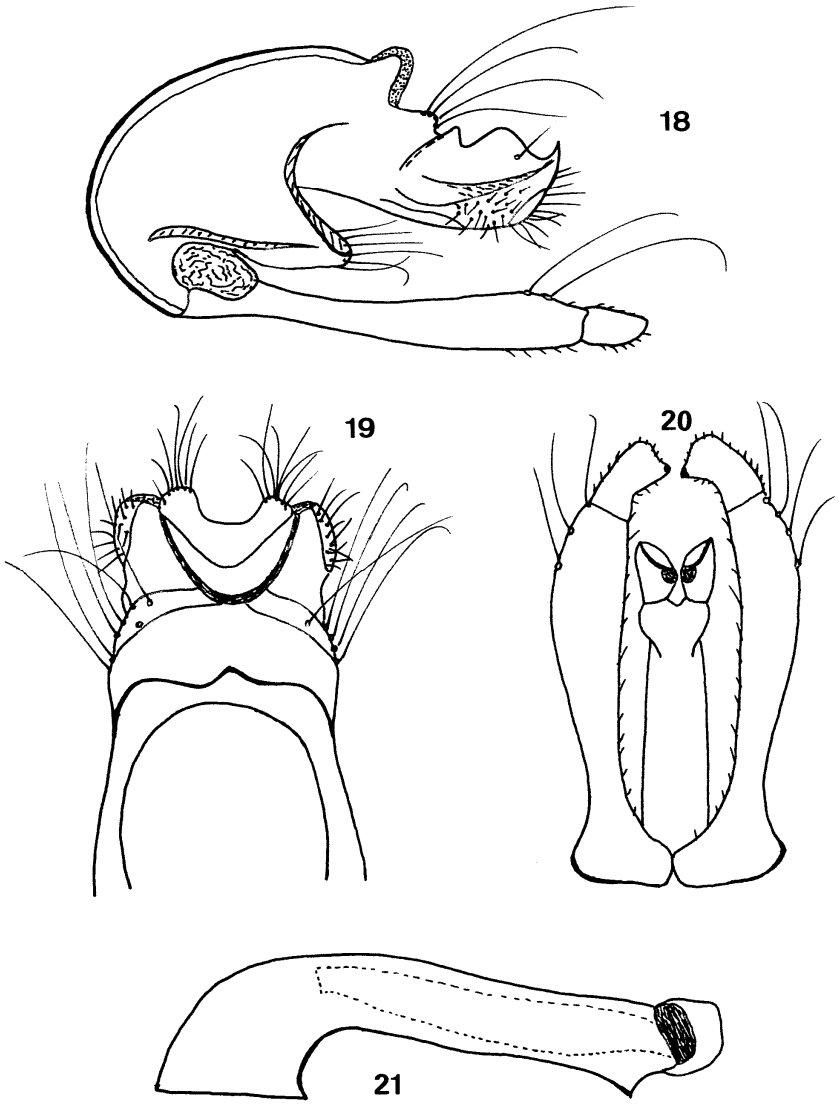

Plate V: Figures 18-21. *Hydropsyche trirostrata* n. sp. Male genitalia. 18: lateral. 19: dorsal. 20: ventral. 21: phallus, lateral.

Planche V : Figures 18-21. *Hydropsyche trirostrata* n. sp. Genitalia mâles. 18: vue latérale. 19: vue dorsale. 20: vue ventrale. 21: phallus, vue latérale.

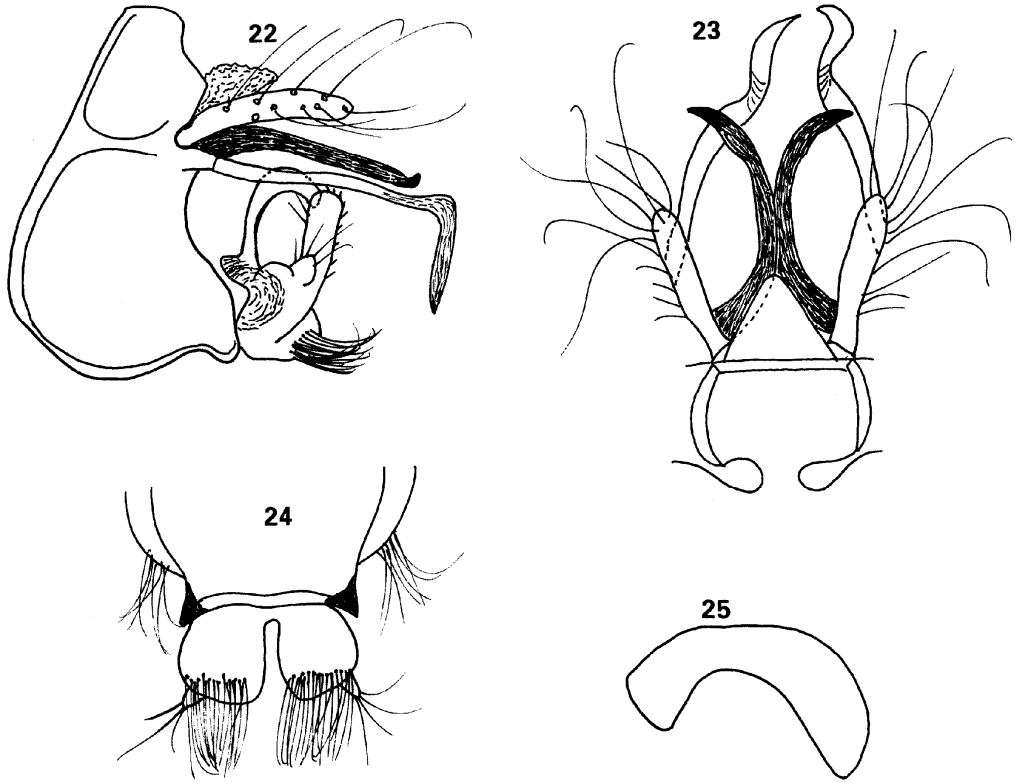

Plate VI : Figures 22-25. *Triaenodes tortuosa* n. sp. Male genitalia. 22: lateral. 23: dorsal. 24: ventral. 25: outline of phallus.

Planche VI : Figures 22-25: *Triaenodes tortuosa* n. sp. Genitalia mâles. 22: vue latérale. 23: vue dorsale. 24: vue ventrale. 25: contour sommaire du phallus.

Tortuosus-a-um (Latin): complicated (in the figurative sense).

The incredible diversity of genus *Triaenodes* in Asia and in the SW Pacific and Australian Region is for me a permanent source of great amazement [see, as far as this Region is concerned, for instance: NEBOISS (1986); NEBOISS & WELLS (1998); MALICKY (2005)]. From New Guinea and adjacent islands not less than 21 species have been described to this day. To try to formulate something about relationship of *T. tortuosa* n. sp. would be only a vain attempt.

Triaenodes contuberna n. sp.

Male holotype: Walmak, 24.-29.X.2008.

Plate VII, Figures 26-29.

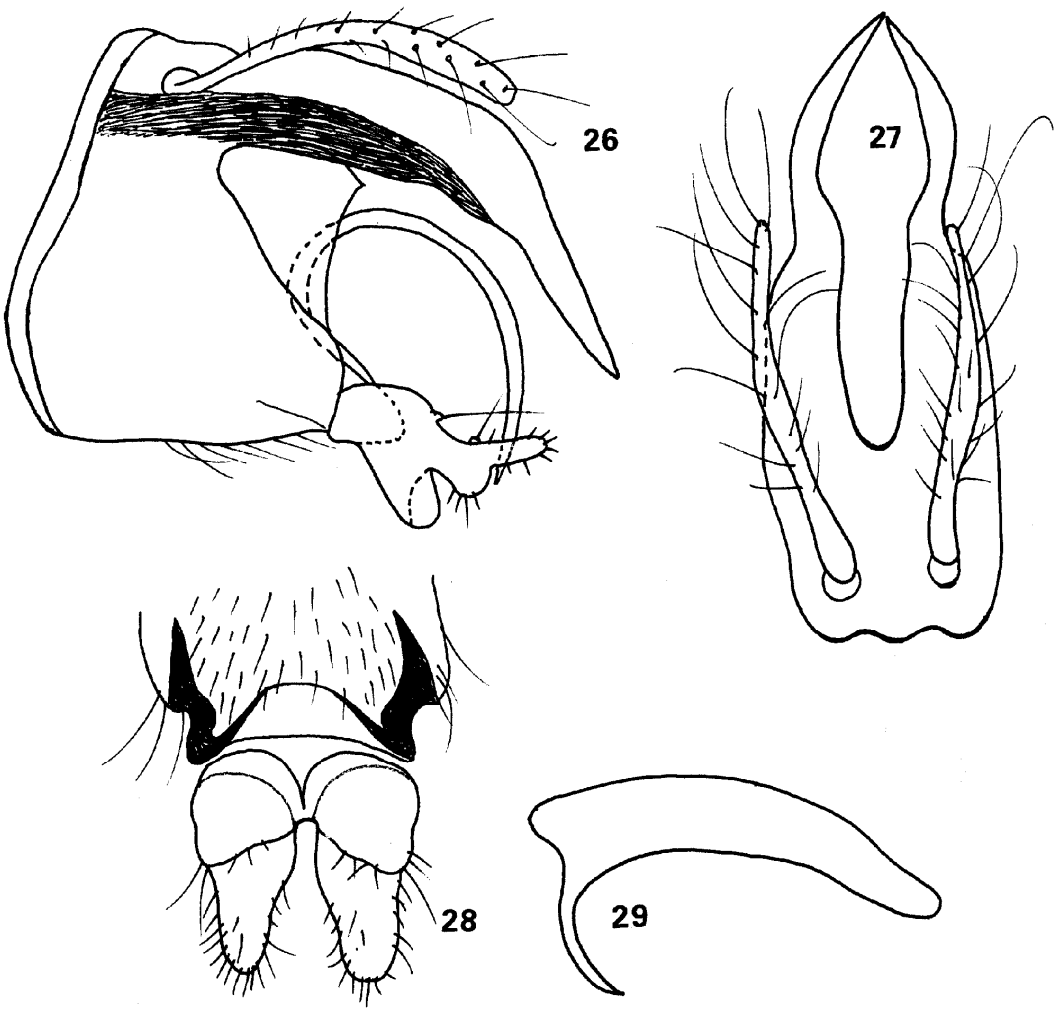

Plate VII: Figures 26-29. *Triaenodes contuberna* n. sp. Male genitalia. 26: lateral. 27: dorsal. 28: ventral. 29: outline of phallus.
Planche VII : Figures 26-29. *Triaenodes contuberna* n. sp. Genitalia mâles. 26: vue latérale. 27: vue dorsale. 28: vue ventrale. 29: contour sommaire du phallus.

Forewing length: 6.8 mm. The forewings are very pale but with a large apical zone distinctly darker (the marginal setae of this zone also dark).

Body of segment IX (lateral view) roughly trapezoidal, roofed by a huge pair of appendages longer than all parts of the genitalia, and arising from a common base in which the long club-shaped superior appendages are implanted; in lateral view these appendages are broad but with slender distal part, distal parts converging and ending in sharp points. In contrast, segment X has a very simple shape, without appendages. From the base of the gonopod a long, slender, arc-

shaped appendage (seen in numerous *Triaenodes*) arises; the gonopod itself has a base marked dorsally by a stiff seta, and followed by an upper branch, longer and bilobed (its two lobes asymmetrical) and by a simple, obtuse, lower branch.

The specific name alludes to the fact that the species coexists in the same locality with *T. tortuosa*. Also for this species nothing which could make sense can be said about relationships.

Oecetis quadrangula n. sp.

Male holotype: Walmak, 24.-29.X.2008.

Photo Figure 30 and Plate VIII, Figures 31-35.

Forewing length: 14 mm. Forewing with its beautiful pattern of fine setation and with its characteristic dark anastomosis: Photo Figure 30. Superior appendages large, practically quadrangular in lateral view. Segment X reduced to single baculiform appendage with base slightly widened. The most characteristic part of the genitalia is the gonopod (in lateral view): high basally, with a pointed ventral "heel" followed by a rather deep rounded emargination, distal part rather short, with blunt apex slightly turned upwards; in ventral view a median cleft separates the rounded, not strongly protruding basal lobes of the two gonopods, and their distal parts are broad, with distinct median relief, and ending in minute points. In Figure 34 only one strong internal spine of the phallus is represented, but Figure 35 shows that the reality is more complex.

The specific name alludes to the quadrangular superior appendages in lateral view.

From New Guinea and adjacent islands, to the best of my knowledge 17 species of *Oecetis* have been described to this day. *O. quadrangula* n. sp. is clearly related to *O. marginata* Kimmins, 1962, with which it shares the dark anastomosis in the forewing (present, too, in at least one more New Guinean species: *longiterga* Kimmins, 1962) as well as the general structural lines of the male genitalia. But the new species is clearly distinct from *emarginata* by its considerably larger size (forewing of *emarginata*: 7-8 mm), by the large quadrangular cercus, and by the very different shape of the gonopods in lateral and ventral view.

Figure 30. *Oecetis quadrangula* n. sp. Forewing (photo R. de Vos).

Figure 30. *Oecetis quadrangula* n. sp. Aile antérieure (photo R. de Vos).

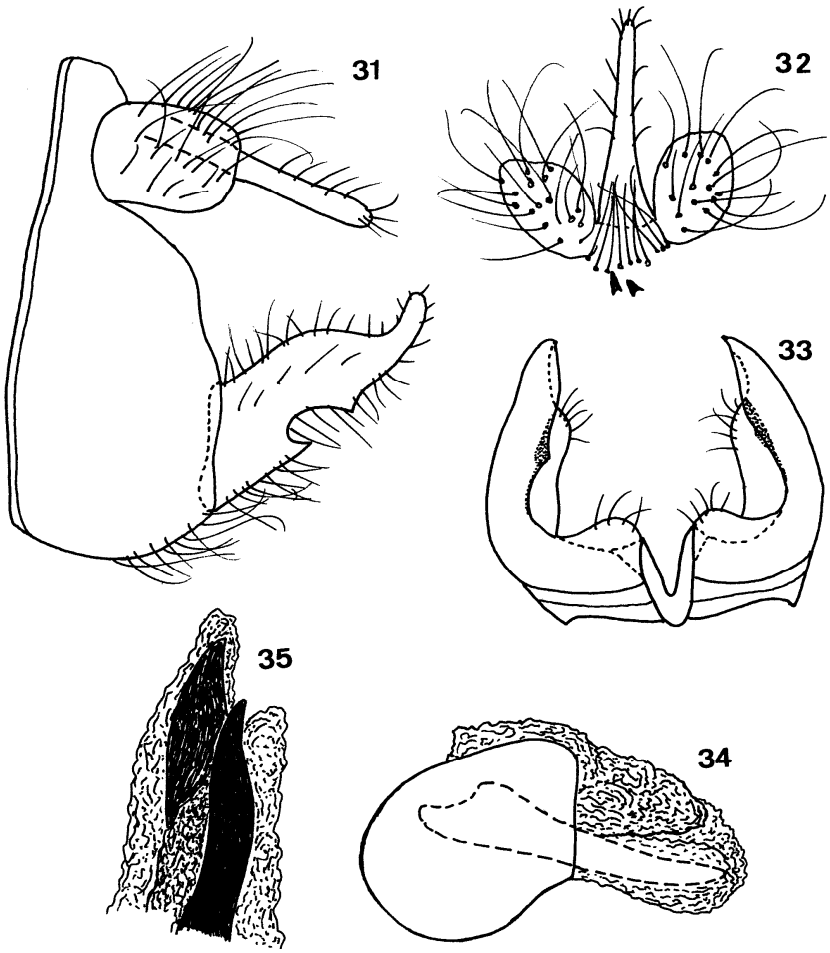

Plate VIII : Figures 31-35. *Oecetis quadrangula* n. sp. Male genitalia. 31: lateral. 32: dorsal. 33: ventral. 34: phallus, lateral. 35: distal part of phallus, dorsal (more strongly magnified).

Planche VIII : Figures 31-35. *Oecetis quadrangula* n. sp. Genitalia mâles. 31: vue latérale. 32: vue dorsale. 33: vue ventrale. 34: phallus, vue latérale. 35: partie distale du phallus, vue dorsale (plus fortement grossie).

Family CALAMOCERATIDAE

Anisocentropus sp.

Plate IX, Figures 36-39.

From Walmak, 24.-29.X.2008 I have one male of *Anisocentropus* in bad condition: wings damaged, the colour pattern vanished. Superficial observation of this specimen before the genitalia could be examined, has lead me to a wrong clue, and it is thanks to information kindly provided by Dr. John B. Ward that I realized that the insect is an *Anisocentropus*. The genitalia

show that the species could very well be one of several in Neboiss' Atlas (1968), but that does not exclude the possibility that we have here a species not yet described. Things being what they are I give these drawings in the hope that they will prove to be of some use as part of a badly needed revision of the genus.

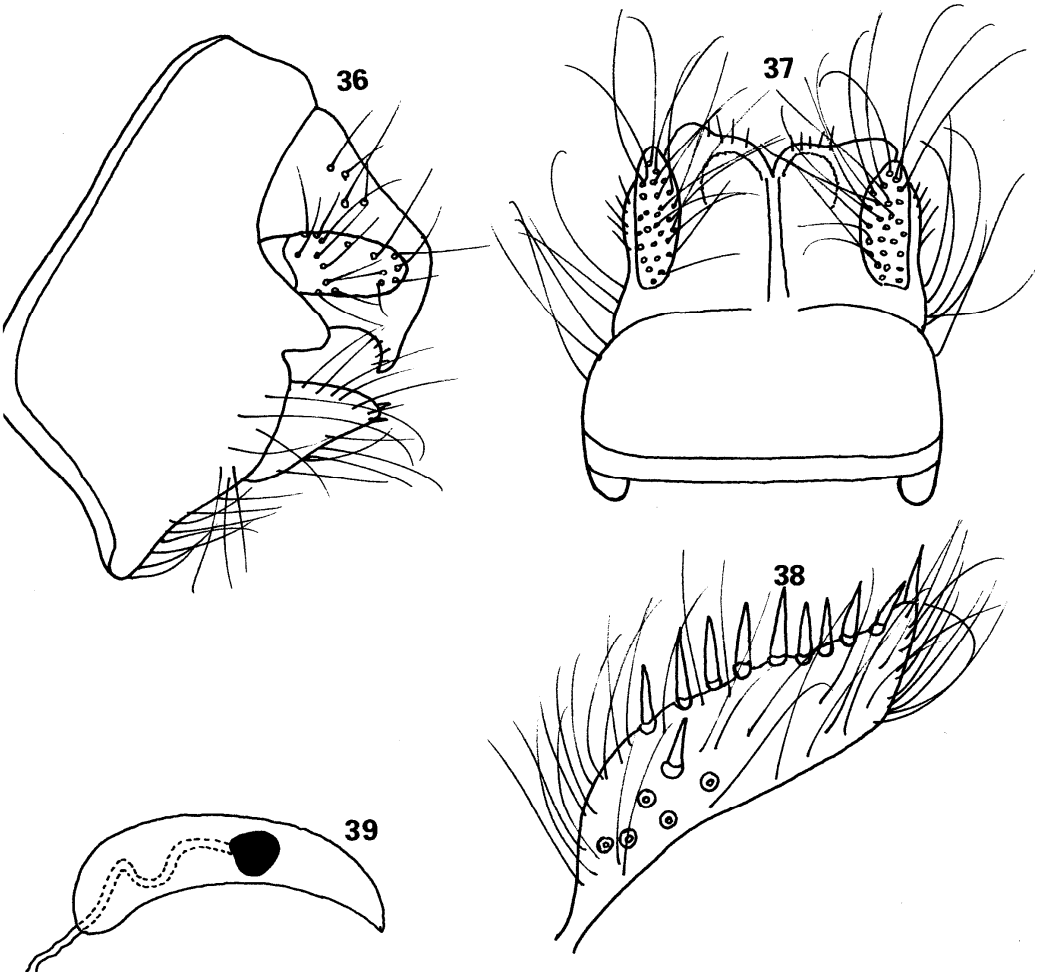

Plate IX: Figures 36-39. *Anisocentropus* sp. Male genitalia. 36: lateral. 37: dorsal. 38: right gonopod, median face (more strongly magnified). 39: phallus.

Planche IX : Figures 36-39. *Anisocentropus* sp. Genitalia mâles. 36: vue latérale. 37: vue dorsale. 38: gonopode droit, face médiane (plus fortement grossie). 39: phallus.

Acknowledgements

Drs. Rob de Vos (Zoological Museum Amsterdam) has sampled during his mainly lepidopterological travels to Papua, the specimens here described, and also patiently insisted that I should study them. Mr. Godard Tweehuysen (library of the Netherlands Entomological Society) has kindly helped filling gaps in my knowledge of publications on the subject. To both of them, my sincere thanks.

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