

On the Trichoptera of New Guinea II

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Abstract – Eight new caddisfly species records are presented from Papua Barat, Indonesia, including the poorly known *Symphitoneurina fulva* (Navás, 1932) and the redescription of *Abacaria papuana* (Kumanski, 1979), comb. n. The following 29 new species are described, all from Papua Barat, Indonesia: *Chimarra arfaka* sp. n., *Chimarra betela* sp. n., *Chimarra botos* sp. n., *Chimarra el-tuna* sp. n., *Chimarra furala* sp. n., *Chimarra kesken* sp. n., *Chimarra lekera* sp. n., *Chimarra lerovida* sp. n., *Chimarra porsen* sp. n., *Chimarra taga* sp. n., *Polycentropus batant* sp. n., *Polycentropus rokon* sp. n., *Polycentropus testver* sp. n., *Diplectronea semeseb* sp. n., *Hydropsyche hosab* sp. n., *Hydropsyche kesken* sp. n., *Hydropsyche kurtab* sp. n., *Hydropsyche lapos* sp. n., *Cheumatopsyche arfakensis* sp. n., *Cheumatopsyche elso* sp. n., *Cheumatopsyche vamosi* sp. n., *Agapetus huzot* sp. n., *Agapetus huzotas* sp. n., *Agapetus sarkos* sp. n., *Lepidostoma arfaka* sp. n., *Lepidostoma batanta* sp. n., *Anisocentropus mentes* sp. n., *Triplectides haram* sp. n., *Oecetis veforma* sp. n. *Polycentropus sinuosus* new species complex and *Lepidostoma japonensis* new species complex in the *Lepidostoma hirtum* branch are established. With 124 figures.

Key words – New Guinea, Indonesia, Batanta, caddisflies, Trichoptera, new species, species complex

INTRODUCTION

One of the least unexplored biodiversity regions of the world is the New Guinea Faunal Region. A growing interest is detectable in Lepidoptera, Coleoptera and Odonata collections but caddisflies (Trichoptera) were and are not in the focus of the biodiversity research. Caddisfly species described and recorded in the New Guinea Region were recently surveyed taxonomically in a synopsis with 352 species (OLÁH 2012a). In this paper, 29 new species and 6 new species records are presented.

MATERIAL

The material, including all holotypes and paratypes, is preserved in 70–80% ethanol and deposited in the collection of the author (Oláh Private Collection,

OPC, presented property of the Hungarian Natural History Museum, Budapest) and in the Naturalis Biodiversity Center, Zoological Museum, Amsterdam, Netherlands (NBC-ZMAN).

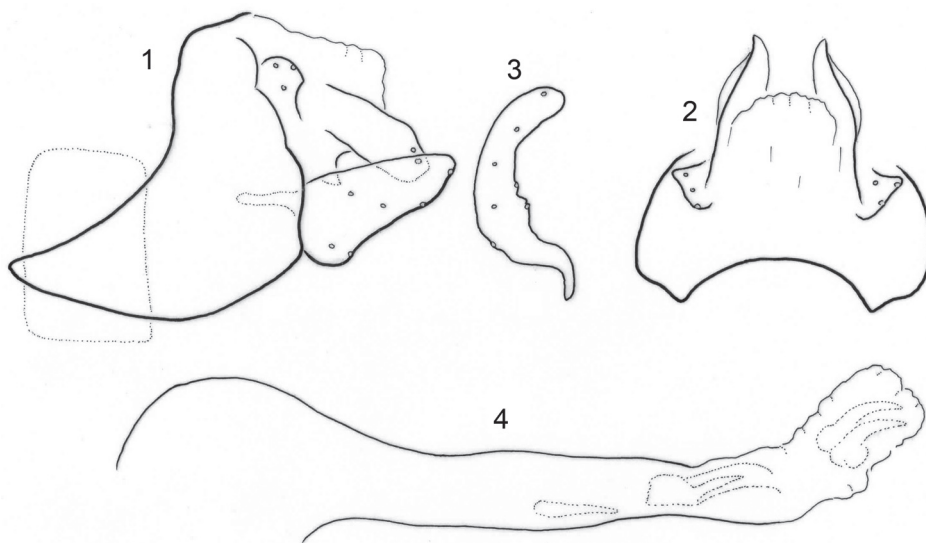
TAXONOMIC PART

Philopotamidae

***Chimarra arfaka* sp. n.**

(Figs 1–4)

Diagnosis – Closely related to *C. goroka* Sykora, 1967 described from the Eastern Highland of Papua New Guinea, but differs by having general colour castaneous brown, not yellowish; discoidal, median and thyridial cells of similar length on forewing, not with very short median cell. The sharp mesal keel on the apicoventrum of segment IX much produced at *C. goroka* and completely lost in *C. arfaka* sp. n. Cerci of *C. arfaka* sp. n. are sharp triangular in dorsal view, not rounded; paraproctal plates straight, not mesad arching; gonopods with rounded apex not pointed either in ventral or lateral view. Particular divergences characterise the two sibling species: their phallic structure remained rather similar, undiverged and the peripheral organ as well the shape of segment IX or even the forewing venation are greatly modified.



Figs 1–4. *Chimarra arfaka* sp. n., holotype, male: 1 = genitalia in left lateral view, 2 = genitalia in dorsal view, 3 = gonopod in ventral view, 4 = phallic organ in left lateral view

Description – Male (in alcohol). Small-sized castaneous brown animal. Setal warts yellow both on head and thorax. Maxillary palp formula I-IV-III-II-V. Fore tibial spurs reduced to diagnostic one: spur formula 1,4,4. Wing membrane brown; forewing length 5 mm; discoidal, median and thyridial cells on forewing having similar length, discoidal cell double tall than median and median cell, double tall than thyridial cell; Rs slightly sinuous with thickening at basal region of discoidal cell; no hyaline window pattern (reduced pigmentation) visible on any of cross-veins; on hindwing diagnostic looping of 2A to join 1A almost complete, 3A present.

Male genitalia. Tergite and sternite VIII distinct, sternite VIII without ventral process. Segment IX synsclerotised, long ventrum, shorter dorsum; ventro-apical keel lost. Segment X membranous, indistinct. Cerci triangular in dorsal view. Paraproctal lateral vertical plates straight, slightly tapering in dorsal view, armed with two sensilla sublateral, well visible in lateral view. Gonopods long triangular with rounded apex. Phallic organ with long and large horizontal phalotheca; internal structure of endotheca containing phalotremal sclerite complex, a single straight spine and two curved black spines.

Type material – Holotype: Indonesia, Papua Barat, Birdshead Peninsula, Arfak Mountains, guesthouse, 1576 m, 1°05.875'S, 133°54.551'E, light trap at resort, 17.V.2014, leg. R. Horváth (1 male, OPC). Paratype: Indonesia, Papua Barat, Birdshead Peninsula, Arfak Mountains, Mokwam, 1510 m, 1°06'S, 133°54'E, 6–10.XI.2011, at light, leg. Papua Insect Foundation (1 male, NBC-ZMAN).

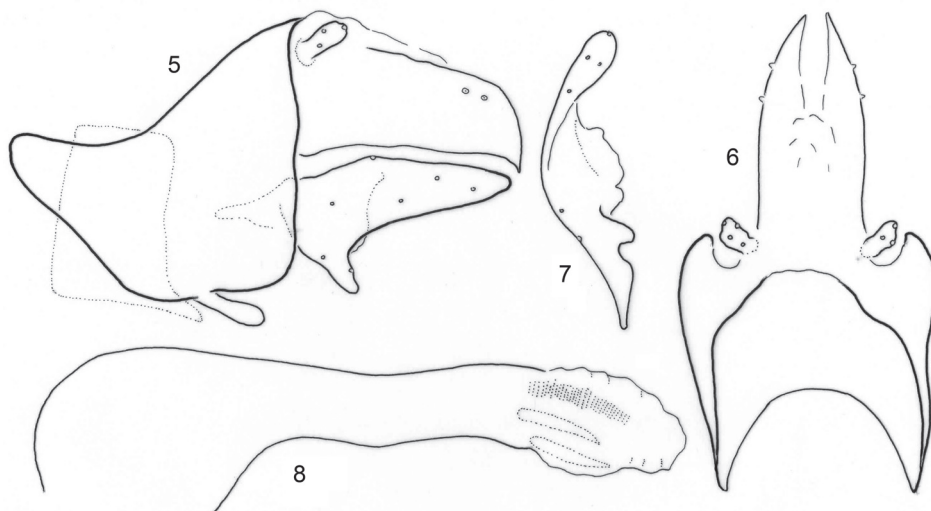
Etymology – *Arfaka*, named after the type locality in the Arfak Mts.

***Chimarra betela* sp. n.**

(Figs 5–8)

Diagnosis – Similar to *Chimarra abeli* Oláh, 2013 described from Batanta Island, but differs by having segment IX with anterad short blunt, not elongate slender pleurons; gonopods with spatulate apex, not with tapering apex; mesal lobe on gonopods long, not short, endophallus with much shorter pair of spines and with an additional large cluster of small spines.

Description – Male (in alcohol). Pale brown animal with darker wings. Maxillary palp formula I-IV-II-III-V. Fore tibial spurs reduced to diagnostic one: spur formula 1,4,4. Wing membrane brown; forewing length 6 mm; discoidal, median and thyridial cells on forewing having similar length, but discoidal cell double tall than median and median cell double tall than thyridial cell; R slightly sinuate, Rs sinuous with thickening before discoidal cell, whose veins also thickened at base; hyaline window pattern (reduced pigmentation) less developed present as lack of pigmentation on cross-veins r-m, m, m-cu, and on arculus.



Figs 5–8. *Chimarra betela* sp. n., holotype, male: 5 = genitalia in left lateral view, 6 = genitalia in dorsal view, 7 = gonopod in ventral view, 8 = phallic organ in left lateral view

Male genitalia. Tergite and sternite VIII distinct, sternite VIII produced in triangular ventral process. Segment IX synsclerotised, its dorsum reduced to short bridle; anterior margin short triangular, posterior margin straight vertical; ventro-apical keel modified into a long process with slightly dilated apex in lateral view. Segment X membranous, indistinct. Cerci small elongated. Paraproctal lateral vertical plate liguliform having downward pointed apex; 2 sensillae styloconica located close to each other dorsoapical. Gonopods elongate, slightly tapering in lateral view; basoventral digitate process followed with long mesal process. Phallic organ with pair of straight short black spines and large cluster of small spines.

Type material – Holotype: Indonesia, Papua Barat, Birdshead Peninsula, Snow Mountains, Baliem Resort, 1947 m, 20 km from Wamena, 4°03.578'S, 139°01.747'E, 23–28.V.2014, at light, leg. R. Horváth (1 male, OPC). Paratypes: same as holotype (2 males, OPC).

Etymology – *Betela*, from “*betelt*”, full in Hungarian, refers to the elongate inner lobes of the gonopods occupying entirely the mesal surface of the ventral body.

***Chimarra botos* sp. n.**

(Figs 9–12)

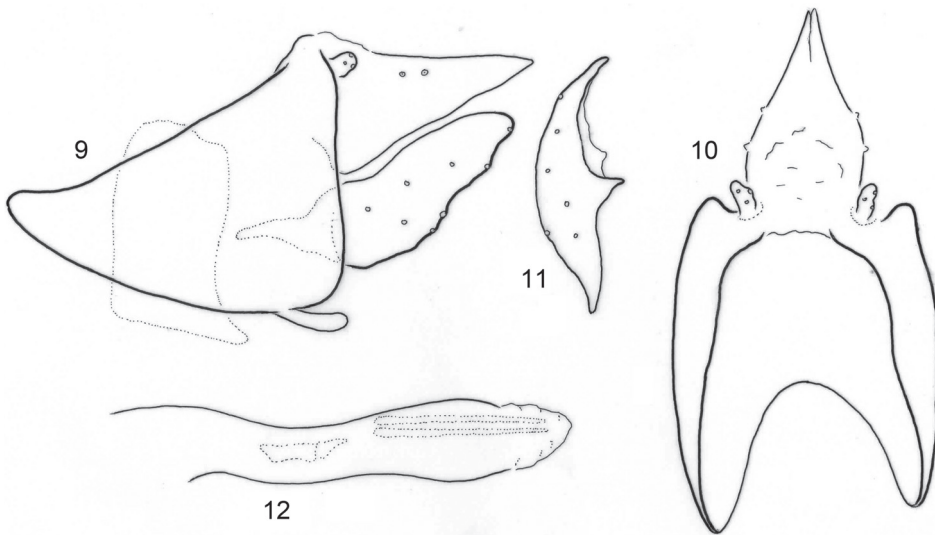
Diagnosis – Similar to *Chimarra sarkos* Oláh, 2013 described from Batanta Island, but differs by having gonopods without so much pronounced angulated

ventrobasal region; by the tapering almost pointed apex of the paraproct in lateral view and by the pattern of the endothecal spine structures.

Description – Male (in alcohol). Small yellow animal, abdomen whitish below. Maxillary palp formula I-IV-II-III-V. Fore tibial spurs reduced to diagnostic one: spur formula 1,4,4. Wing membrane light brown; forewing length 4 mm; discoidal, median and thyridial cells on forewing having similar length, but discoidal cell double tall than median and median cell double tall than thyridial cell; R slightly sinuate, Rs sinuous with thickening before discoidal cell, whose veins also thickened at base; hyaline window pattern (reduced pigmentation) less developed, but present as lack of pigmentation on crossveins r-m, m, m-cu, and on arculus.

Male genitalia. Tergite and sternite VIII distinct, sternite VIII produced in short triangular ventral process. Segment IX synsclerotised, its dorsum reduced to short bridle; anterior margin produced triangular, posterior margin straight vertical; ventroapical keel modified into medium-sized capitate process in lateral view. Segment X membranous, with indistinct shape. Cerci small rounded ovoid. Paraproctal lateral vertical plate liguliform, supplied with 2 sensillae styloconica on each side. Gonopods blunt in lateral and pointed in ventral view, supplied with lateral and mesal triangles in ventral view. Phallic organ with pair of long rod-shaped spines.

Type material – Holotype: Indonesia, Papua Barat, Birdshead Peninsula, Arfak Mountains, mountain top stream, 2149 m, 1°07.620'S, 133°44.333'E, 19.V. 2014, at light, leg. R. Horváth (1 male, OPC).



Figs 9–12. *Chimarra botos* sp. n., holotype, male: 9 = genitalia in left lateral view, 10 = genitalia in dorsal view, 11 = gonopod in ventral view, 12 = phallic organ in left lateral view

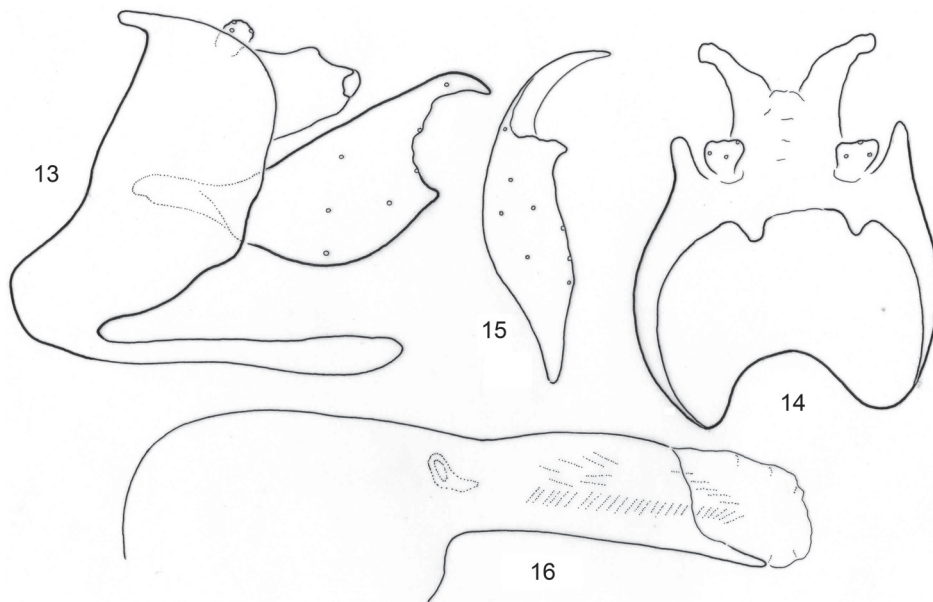
Etymology – *Botos*, from “*botos*”, supplied with rods in Hungarian, refers to the pair of long rod-like spines in the endotheca of the phallic organ.

***Chimarra eltuna* sp. n.**

(Figs 13–16)

Diagnosis – Similar to *Chimarra guentheri* Mey, 206 described from Papua New Guinea (West Sepik), but differs by having paraproct and gonopods with modified shape as well as the endothecal spines of the *C. guentheri* disappeared or rather disintegrated into clusters of fine spines. Median cell on the forewing almost double long than the discoidal cell, not equal.

Description – Male (in alcohol). Pale brown animal with darker wings. Maxillary palp formula I-IV-II-III-V. Fore tibial spurs reduced to diagnostic one: spur formula 1,4,4. Wing membrane brown; forewing length 7 mm; on forewing discoidal cell half as long as median cell, but discoidal cell double tall than median and median cell double tall than thyridial cell; R slightly sinuate, Rs sinuous with thickening before discoidal cell, whose veins also thickened at base; hyaline window pattern (reduced pigmentation) less developed, present as lack of pigmentation on cross-veins r-m, m, m-cu, and on arculus; on hindwing 2A diagnostic looping to join 1A incomplete, as a result closed cell lacking; 3A present.



Figs 13–16. *Chimarra eltuna* sp. n., holotype, male: 13 = genitalia in left lateral view, 14 = genitalia in dorsal view, 15 = gonopod in ventral view, 16 = phallic organ in left lateral view

Male genitalia. Tergite and sternite VIII distinct, sternite VIII produced in triangular ventral process. Segment IX synsclerotised, its dorsum as long as sternum; anterior and posterior margin straight vertical; ventroapical keel modified into very long (longer than gonopods) process with slightly dilated apex in lateral view. Segment X membranous, indistinct. Cerci small. Paraproctal lateral vertical plate short, laterad turning in dorsal view; sensillae styloconica indistinct. Gonopods broad based with slender downward and mesad turning apical half. Phallic organ with large clusters of small spines.

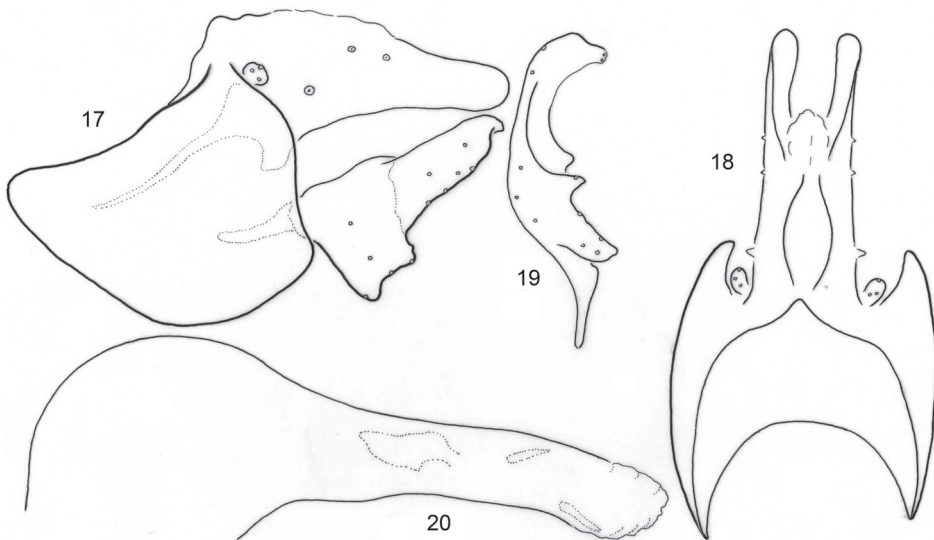
Type material – Holotype: Indonesia, Papua Barat, Birdsheed Peninsula, Arfak Mountains, Demaisi, 1637 m, 1°10'S, 133°53'E, 14.XI.2014, leg. Papua Insect Foundation (1 male, OPC). Paratype: same as holotype (1 male, OPC).

Etymology – *Eltuna*, from “*eltünt*”, disappeared in Hungarian, refers to the three endothecal spines of *C. guentheri* modified (disappeared) into clusters of small spines.

Chimarra furala sp. n.

(Figs 17–20)

Diagnosis – This new species has rather unique paraproct and gonopods structure distinguishing from all the known species. Gonopods are very complex, especially the internal or mesal surface. The simple liguliform external part of the



Figs 17–20. *Chimarra furala* sp. n., holotype, male: 17 = genitalia in left lateral view, 18 = genitalia in dorsal view, 19 = gonopod in ventral view, 20 = phallic organ in left lateral view

paraproct produced an elaborated internal structure inside the body of segment IX; at around the posterior margin of segment IX the liguliform lateral plates of the paraproct produce ventrad, turning short sclerotised band almost touching mesad, giving a ventral support for the phallotheca as well as a long thin apophysis directed anterad.

Description – Male (in alcohol). Medium-sized brown animal. Maxillary palp formula I-IV-(II,III)-V. Fore tibial spurs reduced to diagnostic one: spur formula 1,4,4. Wing membrane brown; forewing length 5 mm; discoidal, median and thyridial cells on forewing having similar length, discoidal cell double tall than median and median cell double tall than thyridial cell; R slightly, Rs strongly sinuous with thickening before discoidal cell, basal veins of discoidal cells also thick; hyaline window pattern (reduced pigmentation) less developed, present as lack of pigmentation on crossveins r-m, m, m-cu, and on arculus; on hindwing 2A diagnostic looping to join 1A incomplete, as a result closed cell lacking; 3A present.

Male genitalia. Tergite and sternite VIII distinct, sternite VIII without ventral process. Segment IX synsclerotised, round triangular in lateral view; ventroapical keel lacking. Segment X membranous, indistinct. Cerci reduced to small setose knot. Paraproctal lateral vertical plates liguliform in lateral view, parallel-sided in dorsal view with rounded apex; 2 sensillae styloconica located middle dorsad and one single with elevated alveolus moved basad. Gonopods complex, especially its mesal surface. Phallic organ with large spherical basal section; endotheca with two short spines; phallotremal sclerite indistinct.

Type material – Holotype: Indonesia, Papua Barat, Birdshead Peninsula, Arfak Mountains, Demaisi, 1637 m, 1°10'S, 133°53'E, 14.XI.2014, leg. Papua Insect Foundation (1 male, OPC).

Etymology – *Furala* from “*fura*”, funny, unusual in Hungarian, refers to the complex structures evolved both in paraproct and gonopod shape.

***Chimarra kesken* sp. n.**

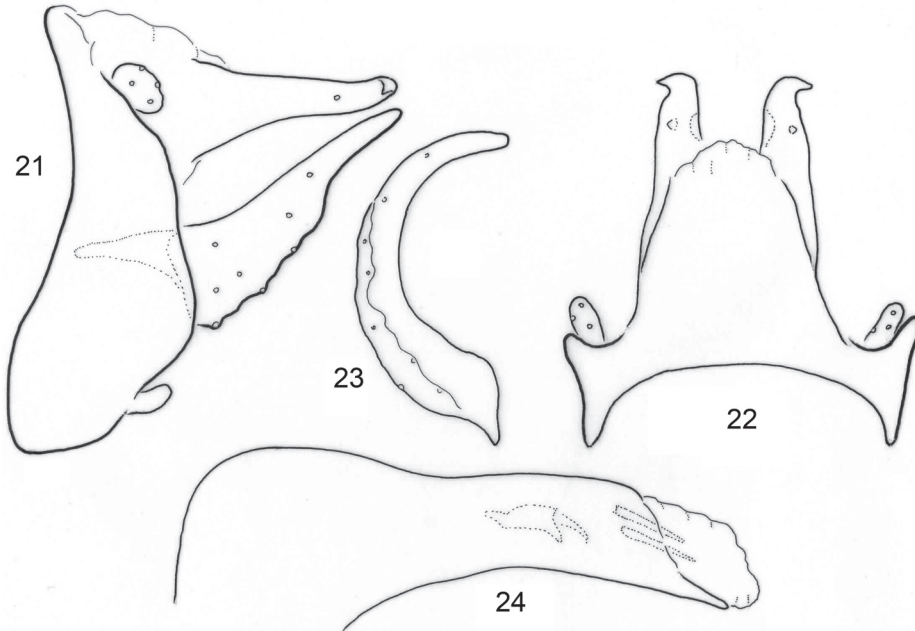
(Figs 21–24)

Diagnosis – Closely related to *C. aiyura* Korboot, 1965 described from the Eastern Highland of Papua New Guinea. The abdomen of the *C. aiyura* holotype is mounted on a microscope slide, but distorted, therefore the paratype was cleared and the species was redrawn by NEBOISS (1987). However, the original drawings by KORBOOT (1965) from the holotype and the Neboiss's drawings from the paratype are so much different that they may represent two species or even two genera. Our species from the Arfak Mts is compared to Neboiss's drawings from the paratype. Similarly to *C. aiyura* our new species *C. kesken* sp. n. is also dark-winged and yellow-bodied and its phallic organ is also very similar. It differs by the significant

abbreviation of segment IX, by the produced hook formation on the apex of the paraproct, by the lack of the very much produced, heavily sclerotised triangular outgrowth midway laterad on paraproct; by the lateral and ventral shape of the gonopods and by the elongation of median cell on the forewing.

Description – Male (in alcohol). Medium-sized dark-winged and yellow-bodied animal. Maxillary palp formula I-IV-III-II-V. Fore tibial spurs reduced to diagnostic one: spur formula 1,4,4. Wing membrane dark; forewing length 7 mm; median cell much longer than length of discoidal and thyridial cells on forewing; discoidal cell double tall than median and median cell double tall than thyridial cell; Rs slightly sinuous with thickening at basal region of discoidal cell; hyaline windows (reduced pigmentation) present on r-m and m cross-veins as well as along basal M fork and arculus.

Male genitalia. Tergite and sternite VIII distinct, sternite VIII without ventral process. Segment IX synsclerotised, long ventrum shorter dorsum; ventroapical process short. Segment X membranous, indistinct. Cerci rounded in lateral view. Paraproctal lateral vertical plates straight, slightly tapering and its apex armed with laterad directed hook. Gonopods semi-circular in ventral view. Phallic organ with long and large horizontal phallosome; internal structure of endotheca containing phallosomal sclerite complex, one pair of straight spine short black spines.



Figs 21–24. *Chimarra kesken* sp. n., holotype, male: 21 = genitalia in left lateral view, 22 = genitalia in dorsal view, 23 = gonopod in ventral view, 24 = phallic organ in left lateral view

Type material – Holotype: Indonesia, Papua Barat, Birdshead Peninsula, Arfak Mountains, mountain top stream, 2149 m, 1°07.620'S, 133°44.333'E, 19.V. 2014, at light, leg. R. Horváth (1 male, OPC). Paratype: same as holotype (1 male, OPC).

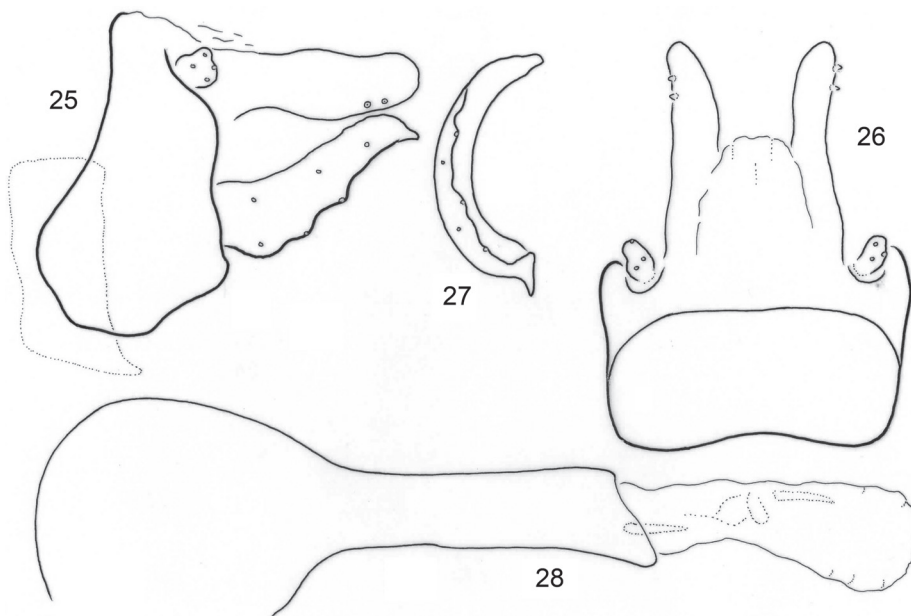
Etymology – *Kesken*, from “keskeny”, narrow in Hungarian, refers to the short, abbreviated body of segment IX.

***Chimarra lekera* sp. n.**

(Figs 25–28)

Diagnosis – Similar to *Chimarra sarkos* Oláh, 2013 described from Batanta Island, but differs by not having any keel or process on the ventroapical region of segment IX; lateral shape of segment IX vertically elongate, not triangular; paraprocts and gonopods differently shaped; paraproctal pair of sensilla located ventrad, not dorsad; endotheca of the phallic organ with a pair of black medium long spine, not with a pair of small spine clusters.

Description – Male (in alcohol). Small yellow animal with darker wings. Maxillary palps broken. Fore tibial spurs reduced to diagnostic one: spur formula 1,4,4. Wing membrane brown; forewing length 4 mm; discoidal, median and thyridial cells on forewing having similar length, but discoidal cell double tall than median and thyridial cells; R slightly sinuate, Rs sinuous with thicken-



Figs 25–28. *Chimarra lekera* sp. n., holotype, male: 25 = genitalia in left lateral view, 26 = genitalia in dorsal view, 27 = gonopod in ventral view, 28 = phallic organ in left lateral view

ing at discoidal cell; hyaline window pattern (reduced pigmentation) present as lack of pigmentation on crossveins r-m, m, m-cu, as well as on longitudinal vein A1 and on arculus.

Male genitalia. Tergite and sternite VIII distinct, sternite VIII produced in short triangular ventral process. Segment IX short, synsclerotised, its dorsum shorter than ventrum; ventroapical keel or process lost. Segment X membranous, with indistinct shape. Cerci small rounded ovoid. Paraproctal lateral vertical plate liguliform supplied with 2 sensillae styloconica on ventral margin subapicad on each side. Gonopods falcate in ventral and lateral view. Phallic organ with pair of black rod-shaped spines.

Type material – Holotype: Indonesia, Papua Barat, Birdshead Peninsula, Snow Mountains, Baliem Resort, 1947 m, 20 km from Wamena, 4°03.578'S, 139°01.747'E, 23–28.V.2014, at light, leg. R. Horváth (1 male, OPC).

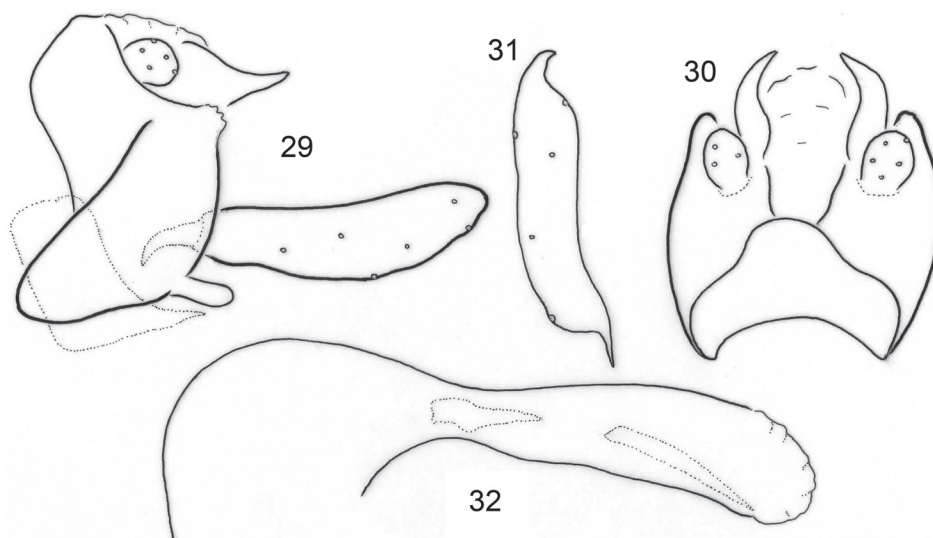
Etymology – *Lekera*, from “*lekerekített*”, rounded in Hungarian, refers to the rounded apex of the paraproctal lateral plate.

***Chimarra lerovida* sp. n.**

(Figs 29–32)

Diagnosis – Wing venation and genital architecture are similar to *C. cyclopica* Kimmins, 1962 described from the Cyclops Mts (Indonesia, Papua), but differs by representing a more ancestral state of the cerci. *C. cyclopica* is characterized by a very specialized development on segment IX. Its dorsal apical margin is produced in a pair of spatulate highly setose process. This apomorphic genital trait on segment IX is a product of unique evolution of the cerci. In the original species description, KIMMINS (1962) did not recognise the lack of cerci. In the genus *Chimarra* Stephens, 1829 there are several lineages having various processes on the dorsum of segment IX, but the cerci are always present. At *C. cyclopica* the cerci have modified into this elongated setose structure and partially fused to segment IX. *C. lerovida* sp. n. has similar body and genital structures to the *C. cyclopica*, including the endotheal spine pattern, without the elongate setose process, but with enlarged cerci.

Description – Male (in alcohol). Medium-sized pale brown animal. Maxillary palp formula I-IV-II-III-V, segment II much shorter than segment III. Fore tibial spurs reduced to diagnostic one: spur formula 1,4,4. Wing membrane brown; forewing length 4 mm; discoidal, median and thyridial cells on forewing increasing in length, discoidal cell double tall than median and median cell double tall than thyridial cell; R slightly, Rs strongly sinuous with thickening before discoidal cell, veins at base of discoidal cell also thickened; hyaline window pattern (reduced pigmentation) less developed, present as lack of pigmentation on cross-



Figs 29–32. *Chimarra lerovida* sp. n., holotype, male: 29 = genitalia in left lateral view, 30 = genitalia in dorsal view, 31 = gonopod in ventral view, 32 = phallic organ in left lateral view

veins r-m, m, m-cu, and on arcus; on hindwing 2A diagnostic looping to join 1A incomplete, as a result closed cell lacking; 3A present.

Male genitalia. Tergite and sternite VIII distinct, sternite VIII with pointed ventral process. Segment IX synsclerotised, short subdivided into ventral and dorsal parts by oblique suture; ventroapical process present. Segment X membranous, indistinct. Cerci enlarged rounded. Paraproctal lateral vertical plates short, tapering apicad and mesad curving; sensillae indistinct. Gonopods enlarged liguliform with apical pointed mesad turning process. Phallic organ with large spherical basal section; endotheca with single spine; phallotremal sclerite elongate tapering posterad in lateral view.

Type material – Holotype: Indonesia, Papua Barat, Birdshead Peninsula, Arfak Mountains, Mokwam, 1510 m, 1° 06' S, 133° 54' E, 6–10.XI.2011, at light, PIF expedition (1 male, OPC).

Etymology – *Lerovida*, from “*lerövidült*”, shortened, abbreviated in Hungarian, refers to the short cerci and paraproct.

***Chimarra porsen* sp. n.**

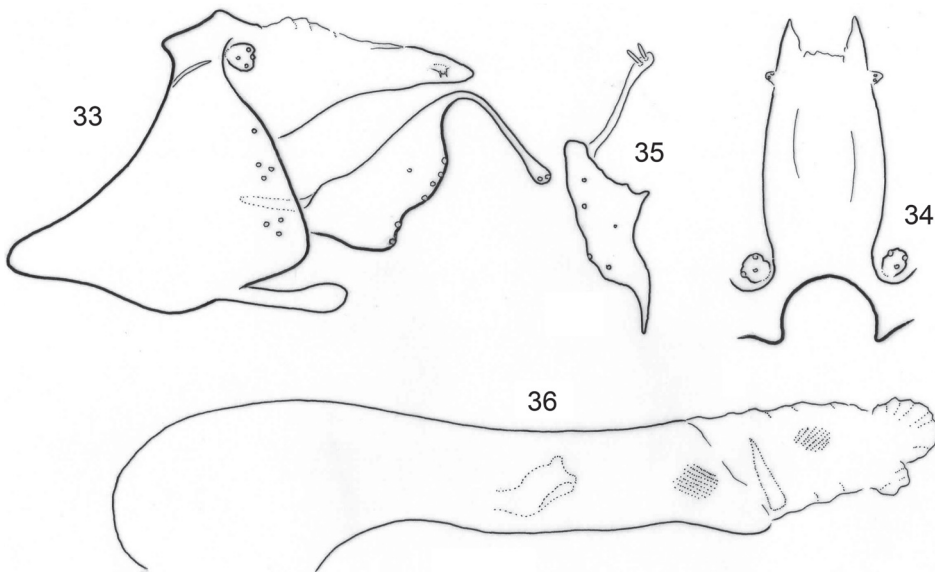
(Figs 33–36)

Diagnosis – Having long and arching filiform dorsoapical process on gonopods this new species belongs to the *C. papuana* species complex established by

OLÁH (2014). Closest to *Chimarra kaliya* Oláh, 2014, but differs by having paraproct with a single fused and enlarged sensilla; gonopods with different lateral pattern and endotheca with a stout single black spine accompanied by two rather large clusters of small black spines.

Description – Male (in alcohol). Medium-sized pale yellow animal. Maxillary palp formula I-IV-II-III-V. Fore tibial spurs reduced to diagnostic one: spur formula 1,4,4. Wing membrane pale; forewing length 5 mm; discoidal, median and thyridial cells on forewing having similar length, discoidal cell double tall than median and median cell double tall than thyridial cell; R slightly, Rs strongly sinuous with thickening at basal region of discoidal cell; no hyaline window pattern (reduced pigmentation) on any of cross-veins.

Male genitalia. Tergite and sternite VIII distinct, sternite VIII with ventral process. Segment IX synsclerotised, long ventrum shorter dorsum; ventroapical keel developed into long capitate process. Segment X membranous, indistinct. Cerci reduced to small setose knot surrounded by light hollow. Paraproctal lateral vertical plates tapering both in lateral and dorsal view, armed with single fused sensilla sublaterad well visible in dorsal view. Gonopods with filiform dorsal stalk and rounded apical margin. Phallic organ with long and large horizontal phallotheca; internal structure of endotheca contains phallotremal sclerite complex, a single long black spine and two clusters of small spines.



Figs 33–36. *Chimarra porsen* sp. n., holotype, male: 33 = genitalia in left lateral view, 34 = genitalia in dorsal view, 35 = gonopod in ventral view, 36 = phallic organ in left lateral view

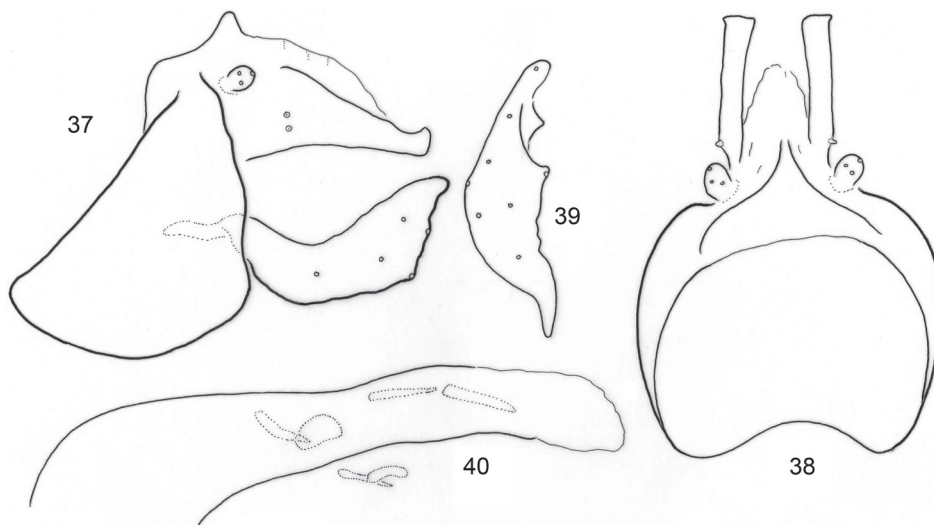
Type material – Holotype: Indonesia, Papua Barat, Birdshead Peninsula, Arfak Mountains, guesthouse, 1576 m, 1° 05.875' S, 133° 54.551' E, light trap at resort, 17.V.2014, leg. R. Horváth (1 male, OPC). Paratype: same as holotype (1 male, OPC). Indonesia, Papua Barat, Birdshead Peninsula, Arfak Mountains, mountain top stream, 2149 m, 133° 44.333' E, 1° 07.620' S, 19.V.2014, at light, leg. R. Horváth (3 males, OPC)

Etymology – *Porsen*, from “pörsenés”, pimple in Hungarian, refers to fused large sensilla, producing a rather large outgrowth in lateral position subapicad on the paraproct. These sensilla are present usually in pairs on the paraproct in this species complex.

***Chimarra taga* sp. n.**

(Figs 37–40)

Diagnosis – A sibling of *C. elvala* Oláh, 2013, described from Indonesia (Batanta Island) having unique suture separating segment IX from tergite IX but differs by having periphallalic organ of paraprocts and gonopods slightly and the phallotremal sclerite complex greatly modified. Head of paraproct truncate, straight transversally at *C. taga* sp. n. and obliquely at *C. elvala*; arching gonopods high and obliquely truncate at *C. taga* sp. n. and low and parallel-sided, slightly tapering at *C. elvala*; wishbone-like phallotremal sclerite high at *C. taga* sp. n. and low at *C. elvala* in lateral view; sclerous band (rod) of the phallotremal



Figs 37–40. *Chimarra taga* sp. n., holotype, male: 37 = genitalia in left lateral view, 38 = genitalia in dorsal view, 39 = gonopod in ventral view, 40 = phallic organ in left lateral view

sclerite complex covered by the broad phallotremal sclerite at *C. taga* sp. n. and free located ventrad of the phallotremal sclerite *C. elvala* in lateral view.

Relying only upon the traditional gross morphological characters of the periphallic structure it would be difficult to establish the specific delimiting traits for this species. The slight structural modifications on the paraproct and gonopods would require a large sample size to determine the ranges of intrapopulational variation. The fine structure analysis of the phallotremal sclerite complex has permitted to confirm species delineation of this sibling species.

Description – Male (in alcohol). Medium-sized brown animal. Maxillary palp formula I-IV-III-II-V. Fore tibial spurs reduced to diagnostic one: spur formula 1,4,4. Wing membrane brown; forewing length 4 mm; discoidal, median and thyridial cells on forewing having similar length, discoidal cell double tall than median and median cell double tall than thyridial cell; R slightly, Rs strongly sinuous with thickening before discoidal cell, whose veins also thickened at base; hyaline window pattern (reduced pigmentation) less developed, present as lack of pigmentation on crossveins r-m, m, m-cu, and on arculus; on hindwing 2A diagnostic looping to join 1A incomplete, as a result closed cell lacking; 3A present.

Male genitalia. Tergite and sternite VIII distinct, sternite VIII without ventral process. Segment IX synsclerotised, triangular in lateral view; ventroapical keel lacking. Segment X membranous, indistinct. Cerci reduced to small setose knot. Paraproctal lateral vertical plates tapering apicad in lateral view, parallel-sided in dorsal view with truncate apex; 2 sensillae styloconica moved basad. Gonopods arching ventrad in lateral view and with two teeth in ventral view. Phallic organ with large spherical basal section; endotheca with two spines; wishbone-like phallotremal sclerite very high in lateral view.

Type material – Holotype: Indonesia, Papua Barat, Birdshead Peninsula, Arfak Mountains, Demaisi, 1637 m, 1° 10' S, 133° 53' E, 14.XI.2014, leg. Papua Insect Foundation (1 male, OPC).

Etymology – *Taga*, from “*tágas*”, broad, spacious in Hungarian, refers to the high leaf-like shape of the wishbone-like phallotremal sclerites in lateral view compared to its sibling *C. elvala* Oláh, 2013 having very low band-like shape. Moreover the gonopods are also high (broad), not low (shallow).

Polycentropodidae

Polycentropus batant sp. n.

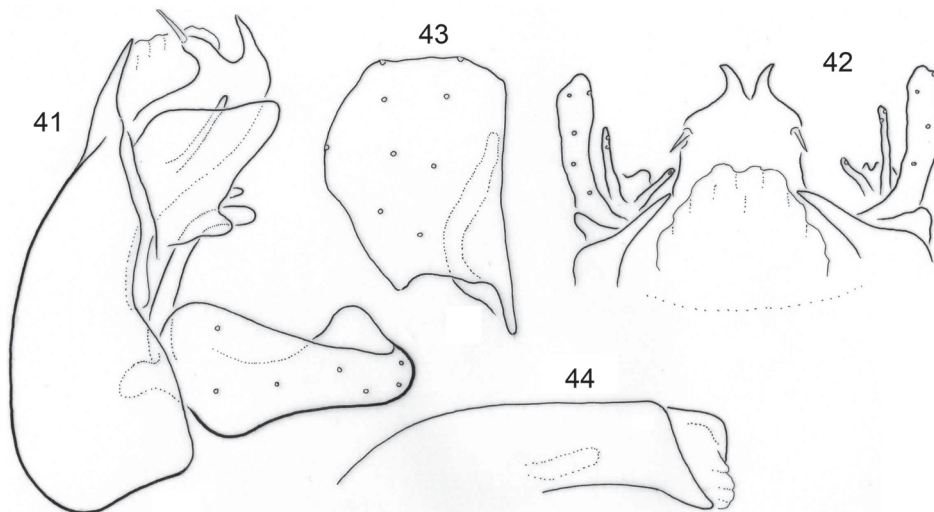
(Figs 41–44)

Diagnosis – Forewing without any pattern. Has some resemblance with *P. auricollis* Kimmins, 1962, but differs by having the apex of the paraproct quadrid, not bifid; black basodorsal process of gonopods very long.

Description – Male (in alcohol). Entire body rather uniformly dark brown, except yellowish prothorax and first leg. Antennae dark and stout. Maxillary palp formula (I, II)-IV-III-V, third segment inserted mesosubapicad. Spur formula 3,4,4. Forewing length 70 mm; forewing membrane without any pattern. Discoidal and median cells in forewing closed, in hindwing open; forewing with apical forks 1-2-3-4-5, hindwing with apical forks 1-2-5.

Male genitalia. Segment IX short subtriangular, shortening dorsad, ending in pointed spine-like elongation. Membranous segment X covering open dorsum. Cerci triangular with two digitiform mesal process and a ventral blunt bilobed process. Paraproct rather complex, dorsal part anterad turning quadrifid; paraproct continuing downward into long subphallic band. Gonopods subtriangular with mesad turning lobe; basodorsal black process very long, serving as phallic guide replacing and reducing ventral part of paraproct into short subphallic band. Phallic apparatus with elongated phallotremal sclerite just discernible and without any visible endothecal spines.

Type material – Holotype, Indonesia, Papua Barat, Batanta Island, valley of Warmon stream, upper waterfall, 0°50'23.25"S, 130°42'35.18"E, 150 m, 20.I.2014, at light, leg. T. Kovács & P. Juhász (1 male, OPC). Paratype: Indonesia, Papua Barat, Batanta Island, Welebed, "waterwork", valley of Kalijakut River, 0°53'22.85"S, 130°38'25.91"E, 105 m, 23.I.2014, UV light trap, leg. T. Kovács, P. Juhász & R. Horváth (1 male, OPC). Indonesia, Papua Barat, Batanta Island, Kalijakut River, 0°52'52.0"S, 130°38'8.0"E, 16.II.2015, at light, T. Kovács & P. Juhász (2 females,



Figs 41–44. *Polycentropus batant* sp. n., holotype, male: 41 = genitalia in left lateral view, 42 = genitalia in dorsal view, 43 = gonopod in ventral view, 44 = phallic organ in left lateral view

OPC). Indonesia, Papua Barat, Batanta Island, Kalijakut River, 0°52'49.1"S, 130°38'4.9"E, 16.II.2015, UV light trap, leg. T. Kovács & P. Juhász (1 male, 1 female; OPC).

Etymology – *Batant*, named after the type locality of the Batanta Island.

Polycentropus sinuosus species complex
(Figs 53–56)

The New Guinea representatives of this genus have typical *Polycentropus* Curtis, 1835 hindwing pattern. Discoidal cell open, not closed like at *Plectrocnemia* Stephens, 1836, fork 1 present, not absent like at *Polyplectropus* Ulmer, 1905. The enigmatic radiation of *Polycentropus* in New Guinea was discovered by KIMMINS (1962), who described six new species from a small area in the centre of the island.

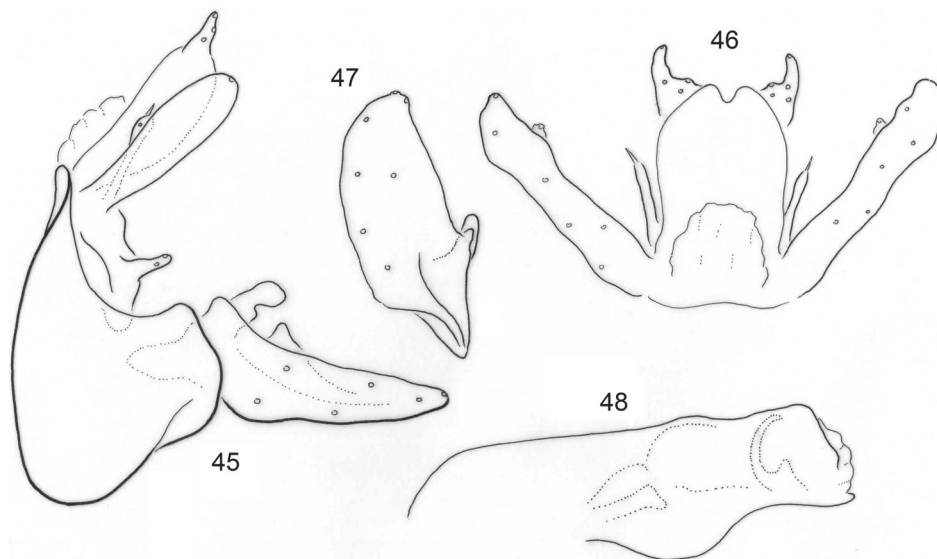
P. rokon sp. n. and *P. testver* sp. n. are close to *P. moselyi* Kimmins, 1962 and *P. sinuosus* Kimmins, 1962, forming together a complex of incipient species, typically diverged by speciation trait of aedeagus. This new species complex suggests that the evolutionary radiation of old lineages produces more recent, contemporary radiation of closely related young incipient species. Besides the aedeagus, they differ in small details by the neutral traits of the male genital structure and by the forewing pattern. *P. moselyi* has forewing with numerous pale spots concentrated to the middle region (Fig. 54), *P. sinuosus* (Fig. 53) and *P. rokon* sp. n. (Fig. 55) have different irregular pale marking in the centre of the wing, *P. testver* sp. n. (Fig. 56) has pale spots distributed along the entire forewing. The basic periphallallic structures, cercus, paraproct, gonopod has similar pattern at the three species, but differ consistently in details. However, most diverged is the fine structure of the intromittent organ.

***Polycentropus rokon* sp. n.**
(Figs 45–48, 55)

Polycentropus moselyi Kimmins, 1962: OLÁH & MEY 2013: 416. Misidentification.

Diagnosis – Similarly to *P. sinuosus* Kimmins, 1962, the forewing is characterized by irregular pale marking, but the pattern is clearly different. There are small divergences in the shape of periphallallic organs compared to all members of the complex; the divergence of endothelial sclerite is pronounced; its C-shaped lateral profile is unique.

Description – Male (in alcohol). Entire body rather uniformly brown, antennae dark and stout. Maxillary palp formula (I, II)-IV-III-V, third segment inserted mesosubapicad. Spur formula 3,4,4. Forewing length 90 mm; forewing membrane with irregular pale marking. Discoidal and median cells in forewing closed, in hindwing open; forewing with apical forks 1-2-3-4-5, hindwing with apical forks 1-2-5.



Figs 45–48. *Polycentropus rokon* sp. n., holotype, male: 45 = genitalia in left lateral view, 46 = genitalia in dorsal view, 47 = gonopod in ventral view, 48 = phallic organ in left lateral view

Male genitalia. Segment IX long ventrad, gradually narrowing dorsad. Membranous segment X short. Cerci elongate. Paraproct rather complex, dorsal process with widely separated lateral terminal setose processes; paraproct continuing downward in inner position with posterior longer pair and ventral shorter pair of processes; ventral part of paraproct entirely encircling phallic organ. Gonopods subtriangular with black basal branch and smaller triangular basomesal arm. Phallic apparatus with elongate phallotremal sclerite just discernible and with C-shaped single, not doubled endothecal sclerite.

Material examined – Holotype: Indonesia, Papua, Kecamatan Abenaho, Pass valley, 1950 m, cultivated area, 3°51'S, 139°05'E, 11–17.II.2005, at light, UNZEN-ZMA Expedition (1male, 1 female, NBC-ZMAN). Paratype: same as holotype (1 male, OPC).

Etymology – *Rokon*, from “rokon”, relative in Hungarian, refers to the close relation to the newly established *P. sinuosus* incipient species complex.

***Polycentropus testver* sp. n.**

(Figs 49–52, 56)

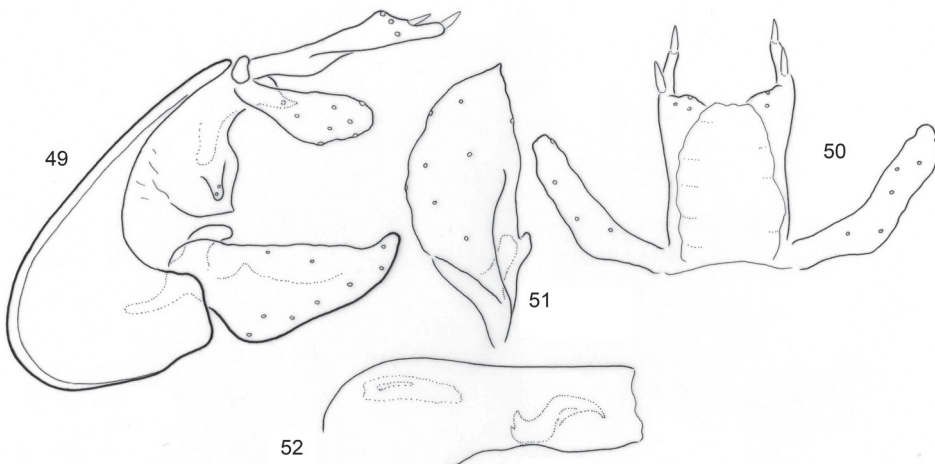
Diagnosis – Forewing pattern is most similar to *P. moselyi* Kimmins, 1962, but the pale pots are distributed almost evenly along the entire forewing, not restricted to wing centre. There are small divergences compared to *P. moselyi* in the

shape of all periphallic organs, but the divergence of endothecal sclerite is very pronounced. Its S-shaped lateral profile is unique.

Description – Male (in alcohol). The entire body is rather uniformly brown coloured, Antennae are dark and stout. Maxillary palp formula (I, II)-IV-III-V, third segment inserted mesosubapicad. Spur formula 3,4,4. Forewing length 10 mm; forewing membrane evenly pale spotted. Discoidal and median cells in forewing closed, in hindwing open; forewing with apical forks 1-2-3-4-5, hindwing with apical forks 1-2-5.

Male genitalia. Segment IX long subquadrangular ventrad narrowing dorsad; antecosta well-developed; dorsum gradually reduced to highly sclerotised, enforced antecosta. Membranous segment X covering open dorsum. Cerci elongate. Paraproct rather complex, dorsal process with widely separated lateral terminal processes each with stout dorsosubapical and apical spine-like seta; paraproct continuing downward in inner position with posterior pair and ventral pair of processes; ventral part of paraproct entirely encircling phallic organ. Gonopods subtriangular with black basal branch and smaller basomesal arm. Phallic apparatus with elongate phallotremal sclerite just discernible and with S-shaped endothecal sclerite appearing doubled and fused basally.

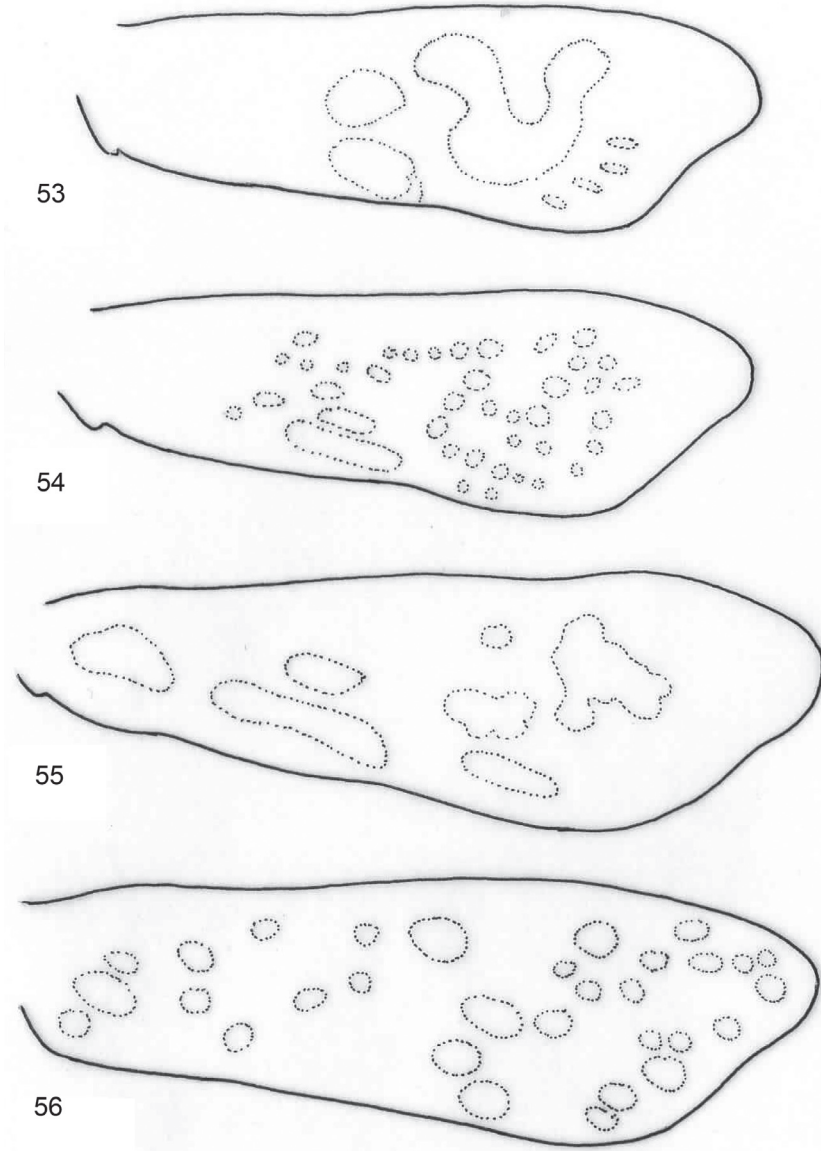
Type material – Holotype, Indonesia, Papua Barat, Birdshead Peninsula, Arfak Mountains, Mokwam, 1510 m, 1°06'S, 133°54'E, 6–10.XI.2011, at light, PIF [= Papua Insect Foundation] expedition (1 male, NBC-ZMAN). Paratypes: same as holotype (2 males, NBC-ZMAN, 1 male, OPC). Indonesia, Papua Barat,



Figs 49–52. *Polycentropus testver* sp. n., holotype, male: 49 = genitalia in left lateral view, 50 = genitalia in dorsal view, 51 = gonopod in ventral view, 52 = phallic organ in left lateral view

Birdshead Peninsula, Arfak Mountains, 2149 m, 1°07.620'S, 133°44.333'E, 19.V.2014, leg. R. Horváth (7 males, 2 females, OPC).

Etymology – *Testver*, from “testvér”, sibling in Hungarian, refers to the close relation to the newly established *P. sinuosus* incipient species complex.



Figs 53–56. Forewing pattern: 53 = *P. sinuosus* Kimmins, 1962, 54 = *P. moselyi* Kimmins, 1962, 55 = *P. rokon* sp. n., 56 = *P. testver* sp. n.

Hydropsychidae

Macronematinae

Macrostemum saundersi (McLachlan, 1866)

Examined material – Indonesia, Papua Barat, Birdshead Peninsula, Nene Valley, Arfak, Benyas, 1°27'S, 134°01'E, 722 m, 17.XI.2011, leg. Papua Insect Foundation (1 male, OPC).

Remarks – This species was described from Misool Island (formerly Mysol), Papua Barat, the westernmost point of New Guinea. We have examined and compared specimen from Papua, Kokoda, Oro Province, eastern region of New Guinea and from the Birdshead Peninsula. Both specimens have slightly different forewing pattern. The specimen from Wau, Morobe Province drawn by NEBOISS (1984) has also slightly different forewing pattern. Neboiss re-examined and re-drew the genitalia of the holotype from Misool Island having also slightly different forewing pattern. However, all these specimens having varying forewing pattern exhibit rather consistent shape of segment X and especially very stable, almost identical phallic organ both in lateral and ventral view.

Diplelectroninae

Diplelectrona semeseb sp. n.

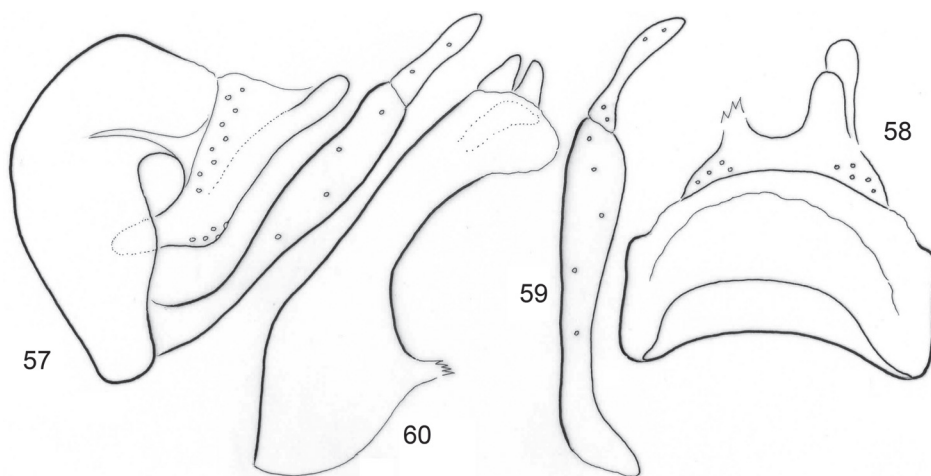
(Figs 57–60)

Diagnosis – This pale species is close to the species complex of *D. mafulua* Kimmins, 1962, *D. triangulata* Sykora, 1967, *D. semes* Oláh et Mey, 2013 from New Guinea. Closest to *D. semes*, but differs by having more enlarged eyes and very elongated tergite IX, not short; open sinus between segment IX and segment X more pronounced; longitudinal suture enforcing the enlarged sinus present, absent at *D. semes*; interlobular excision between dorsoapical setose lobes broad rounded, not narrow triangular. *D. semes* and *D. semeseb* sp. n. are sibling species diverged nearby to each other, but vertically isolated. The locus typicus of *D. semes* is at 1710 m, the locus typicus of *D. semeseb* is on lower elevation of 900 m.

Description – Male (in alcohol). Light animal. Body yellowish, dorsal thoracic sclerites darker. Eyes setaless, very enlarged, almost touching mesad, interocular distance almost disappeared, as a result head dorsum reduced to mesal incomplete longitudinal ridge; present anteriorly and posteriorly; in middle eyes addressed to each other, mesal ridge not developed. Anterodorsal filament on sternite V 1.3× as long as sternite; filament with broad base and thin after. Pair of large internal reticulated sacs present in segment VII. Wings ochraceous with lighter pubescence, without pronounced pattern. Hindwing median cell present. Maxillary palp formula I-III-IV-II-V. Spur formula 2,4,4. Forewing length 8 mm.

Male genitalia. Abdominal segment IX medium long, convex anteriorly; dorsum elongate; posterior margin uniquely modified; open sinus formed between middle of segment IX and ventrum of segment X enforced by paraproct rod. Segment X fused to the tergum X. The dorsoapical setose lobes of segment X (inner lobes of segment X), characteristic for genus, present as pair of inner long rounded setaless lobes, separated by broad and rounded dorsal interlobular excision; fused to more sclerotised paraproctal rodlike margin; ventroapical setose lobe of segment X forming setose hump also merged with paraproctal rodlike lateral complex. Cerci (lateral setose area) setose, vertically elongated, broad, occupying larger basal part of segment X delineated anteriorly by very pronounced suture continuing with sinus and characteristic longitudinal suture. Paraproct (outer lobes of segment X) longer than segment X forming more sclerotised lateral marginal complex together with setose lobes of segment X and running ventrolaterad towards basal plate of gonopod. Gonopods straight, coxopodite with weakly dilated apical third; harpago narrow, arching mesad, with constriction middle. Phallic apparatus with down curving and broadening basal section and with slightly longer tube-forming horizontal apical half with downward bulging apex in lateral view; two pairs of endothelial processes visible, both with triangular shape visible both in lateral and ventral view; lateral pair directed laterad; a pair of phallosomal sclerite longitudinally elongated, less distinct.

Type material – Holotype: Indonesia, Papua, Kab. Yahukimo, Lelambo (distr. Kangguruk, 04°01'S, 139°47'E, 900 m, 24–26.X.2008, at light, leg. P. J. Zumkher (1male, NBC-ZMAN).



Figs 57–60. *Diplectrona semeseb* sp. n., holotype, male: 57 = genitalia in left lateral view, 58 = genitalia in dorsal view, 59 = gonopod in ventral view, 60 = phallic organ in left lateral view

Etymology – *Semeseb*, from “szemesebb”, having more enlarged eye in Hungarian, refers to the enlarged eyes touching mesad on the dorsum.

Hydropsychinae

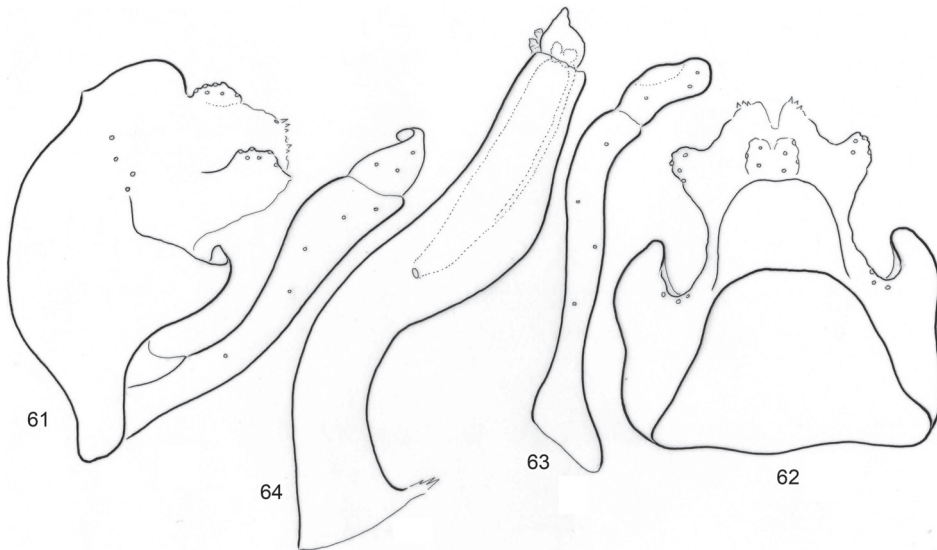
Abacaria papuana (Kumanski, 1979), **comb. n.**
(Figs 61–64)

Diplectrona papuana KUMANSKI, 1979: 195.

Hydropsyche papuana (Kumanski, 1979): MALICKY (2002): 1215.

Diagnosis – This species has lost fork 1 and crossvein *m* on hindwing as well as the proepisternal setose wart on first leg, a character state combination of the genus *Abacaria* Mosely, 1941. The plesiomorphic presence of all the three traits is primary generic character for the genus *Hydropsyche* Pictet, 1834. Therefore, this species is transferred to the genus *Abacaria*.

This small brown species was described as *Diplectrona papuana* by KUMANSKI (1979) due to the presence of a filament connected to sternum V gland, a character of the genera *Diplectrona* Westwood, 1839, *Asmicridea* Mosely, 1953 and *Smicrophylax* Neboiss, 1977 in Hydropsychidae. This gland producing pheromones and defensive substances is known to occur both in males and/or females in 25 of 45 families. Generally present in Annulipalpia, except Dipseudopsidae, and in Spicipalpia. Widespread in Plenitentoria, but often absent in Brevitantoria.



Figs 61–64. *Abacaria papuana* (Kumanski, 1979), male: 61 = genitalia in left lateral view, 62 = genitalia in dorsal view, 63 = gonopod in ventral view, 64 = phallic organ in left lateral view

Various cuticular modifications evolved around the gland opening on sternum V: (1) bald area, (2) scaly patch, (3) reticulation, (4) bulge, (5) cuticular ridge around opening, (6) elongated protuberance, (7) protuberance with grooved filament in Polycentropodiadae, (8) polygon-covered protuberance with grooved filament in Diplelectroninae and Smicrideinae, (9) bulge or protuberance with setae in Hydroptilidae, Glossosomatidae, Rhyacophilidae. An elongated protuberance is present in some *Hydropsyche* species and there are species with unique presence or absence in certain genera (DJERNAES 2011).

This knowledge about the distribution of cuticular modifications evolved around the gland opening on sternum V in Trichoptera was not available when KUMANSKI (1979) described the generic status of his species. Based on venation and genital character he preferred originally to place his new species in the genus *Abacaria*, but that time the abdominal filament was one of the main generic features of *Diplelectrona*. Recently MALICKY (2002) placed *Diplelectrona papuana* in the *H. asiatica* species group of the genus *Hydropsyche*, disregarding Kumanski's original arguments and the new results in hydropsychines on the evolution of filament (DJERNAES 2011) and neuration (OLÁH & JOHANSON 2008). *Abacaria* has open median cell on hindwing, *Hydropsyche* has closed median cell on hindwing; *Abacaria* has only 2-3-5 hindwing forks, *Hydropsyche* has 1-2-3-5 hindwing forks present. Moreover *Hydropsyche* has proepisternal setal wart present, *Abacaria* has lost proepisternal setal wart. Kumanski's species has open median cell on hindwing, only 2-3-5 forks present on hindwing and proepisternal setal wart absent. It is a real *Abacaria* in spite of the lateral filament present on the protuberance around the opening of sternum V gland: *Abacaria papuana* (Kumansky, 1979), **comb. n.**

The species was described from West Sepik Province and later found more east in the Morobe Province in Papua New Guinea and here we found westward in Indonesian Papua. Our specimen has some divergence; here we give an additional description with drawings.

Male (in alcohol). Body and wings pale brown. Maxillary palp formula I-IV-III-II-V. Proepisternal setal wart present. Spur formula 2,4,4. Forewing length 7 mm; hindwing median cell open; hindwing with forks 2, 3 and 5.

Male genitalia. Segment IX fused annular and short; its median keel long and broad; apical lobe on posterolateral margin triangular, with mesad curving apex. Intersegmental profile between ninth and tenth segments deep stepwise. Segment X short and high in lateral view and trilobed in dorsal view; ventroapical lobes laterad directed; cerci fused and shifted to the intersegmental profile. Coxopodite of gonopod clavate as long as apex of segment X and slightly S-shape; harpago mesad curving, rounded flat. Phallic organ slightly S-shaped, bellied middle; horizontal section with upward curving apex; endothelial and phallosomal sclerite complex movable and positioned dorsoapical; sclerotised endothelial processes with dorsoapical

process; phallotremal sclerites composed of double pairs of small rounded buttons or knobs; pair of small membranous endothelial processes present, located dorsoapical.

Examined material – Indonesia, Papua, Kab. Yahukimo, Lelambo (distr. Kangguruk, 4°01'S, 139°47'E, 900 m, 31. 24–26.X.2008, at light, leg. P. J. Zumkher (1 male, NBC-ZMAN).

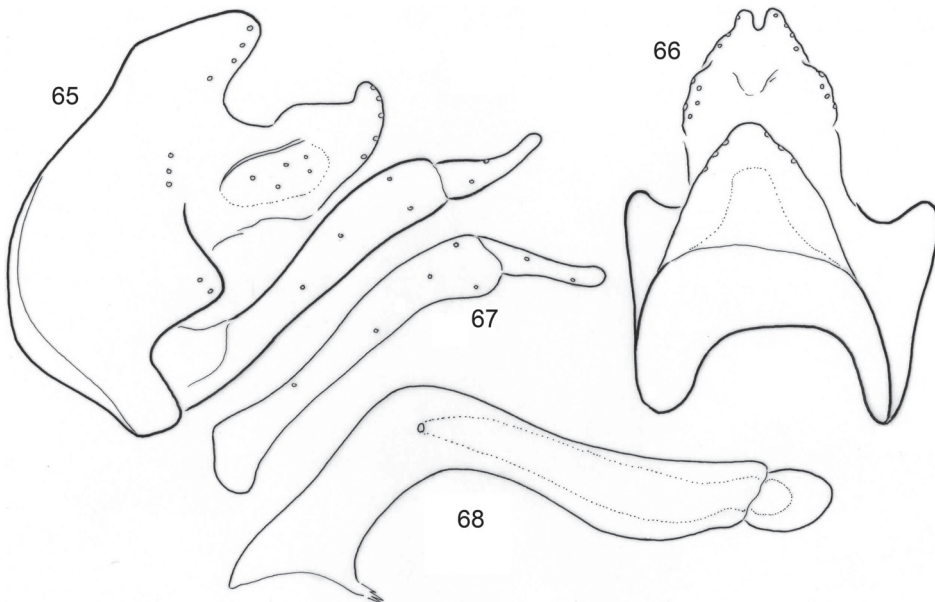
Hydropsyche flynni Korboot, 1964

Examined material – Indonesia, Papua Barat, Birdshead Peninsula, Snow Mountains, Baliem Resort, 1947 m, 20 km from Wamena, 4°03.578'S, 139°01.747' E, 23–28.V.2014, at light, leg. R. Horváth (1 male, 3 females, OPC).

***Hydropsyche hosab* sp. n.**

(Figs 65–68)

Diagnosis – This medium sized species with marble spotted stramineous forewing has hindwing with close median cell and 1, 2, 3, 5 fork present as well as asymmetric pretarsal claws on foreleg and abbreviated segment V of maxillary palp. This is the character state combination of the *H. ungulata* species group. Closest to *H. carolae* Oláh et Johanson, 2008, but differs by having dorsal keel of segment IX more robust rounded triangular; intersegmental profile less closed;



Figs 65–68. *Hydropsyche hosab* sp. n., holotype, male: 65 = genitalia in left lateral view, 66 = genitalia in dorsal view, 67 = gonopod in ventral view, 68 = phallic organ in left lateral view

dorsoapical setose lobe slender; setose surface of cerci reduced; phallobase curving different; sclerotised endothelial process ovoid, not circular.

Description – Male (in alcohol). Medium sized stramineous animal. Wings ochraceous with lighter pubescence, with marble spotted pattern on entire forewing. Hindwing median cell present. Maxillary palp formula I-IV-III-II-V. Asymmetric pretarsal claws and abbreviated segment V of maxillary palp pronounced. Spur formula 2,4,4. Forewing length 11 mm.

Male genitalia. Segment IX fused annular and short; its median keel broad triangular with granulose dorsal surface; apical lobe on posterolateral margin triangular. Lateral intersegmental profile between ninth and tenth segments forming large rounded sinus. Segment X long and low; lateral setose area, cerci ovoid; dorsoapical setose lobes slightly upward curving in lateral and bilobed in dorsal view. Coxopodite of gonopod as long as apex of segment X, harpago broad, almost parallel-sided in ventral view. Phallic organ with very high obliquely downward turning phallobase, broad endophallus, pair of rounded phallostremal sclerite, a pair of elongated circular sclerotised endothelial process.

Type material – Holotype, male: Indonesia, Papua Barat, Birdshead Peninsula, Nimbokrang, 81 m, 4°07.983'S, 140°08.216'E, 23–28.V.2014, at light, leg. R. Horváth (1 male, OPC).

Etymology – *Hosab*, from “hosszabb”, longer in Hungarian, refers to the elongated ovoid shaped sclerotised endothelial process that is longer than at his sister species, *H. carolae*.

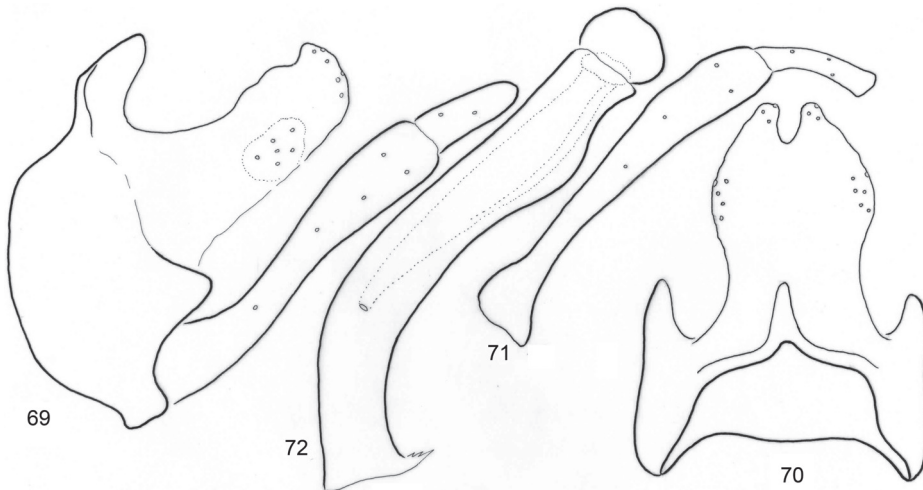
Hydropsyche kesken sp. n.

(Figs 69–72)

Diagnosis – This small stramineous species has hindwing with close median cell and 1-2-3-5 fork present as well as asymmetric pretarsal claws and abbreviated segment V of maxillary palp. A character state combination of the *H. ungulata* species group. Closest to *H. carolae* Oláh et Johanson, 2008, but differs by having dorsal keel of segment IX narrow blade-shaped in dorsal view, not broad triangular and low in lateral view, not high; setose surface of cerci reduced; phallobase curving different, sclerotised endothelial process circular, not ovoid.

Description – Male (in alcohol). Small light stramineous animal. Wings ochraceous with lighter pubescence, without pronounced pattern. Hindwing median cell present. Maxillary palp formula I-IV-III-II-V. Asymmetric pretarsal claws and abbreviated segment V of maxillary palp pronounced. Spur formula 2,4,4. Forewing length 7 mm.

Male genitalia. Segment IX fused annular and short; its median keel very narrow with granulose dorsal surface; apical lobe on posterolateral margin trian-



Figs 69–72. *Hydropsyche kesken* sp. n., holotype, male: 69 = genitalia in left lateral view, 70 = genitalia in dorsal view, 71 = gonopod in ventral view, 72 = phallic organ in left lateral view

gular. Lateral intersegmental profile between ninth and tenth segments forming large rounded sinus. Segment X long and low; lateral setose area, cerci rounded; dorsoapical setose lobes slightly upward curving in lateral and bilobed in dorsal view. Coxopodite of gonopod as long as apex of segment X, harpago broad, almost parallel-sided with truncate head in ventral view. Phallic organ with high obliquely downward turning phallobase, broad endophallus, pair of vertically high phallotremal sclerite, pair of circular sclerotised endothelial process present.

Type material – Holotype: Indonesia, Papua Barat, Birdshead Peninsula, Tamrau Plateau, Senopi, 0°50'S, 132°55'E, 476 m, 21–22.XI.2011, leg. Papua Insect Foundation (1 male, NBC-ZMAN). Paratype: same as holotype (1 male, OPC).

Etymology – *Kesken*, from “keskeny”, narrow in Hungarian, refers to the very narrow dorsal keel of segment IX as visible in dorsal view.

***Hydropsyche kurtab* sp. n.**

(Figs 73–76)

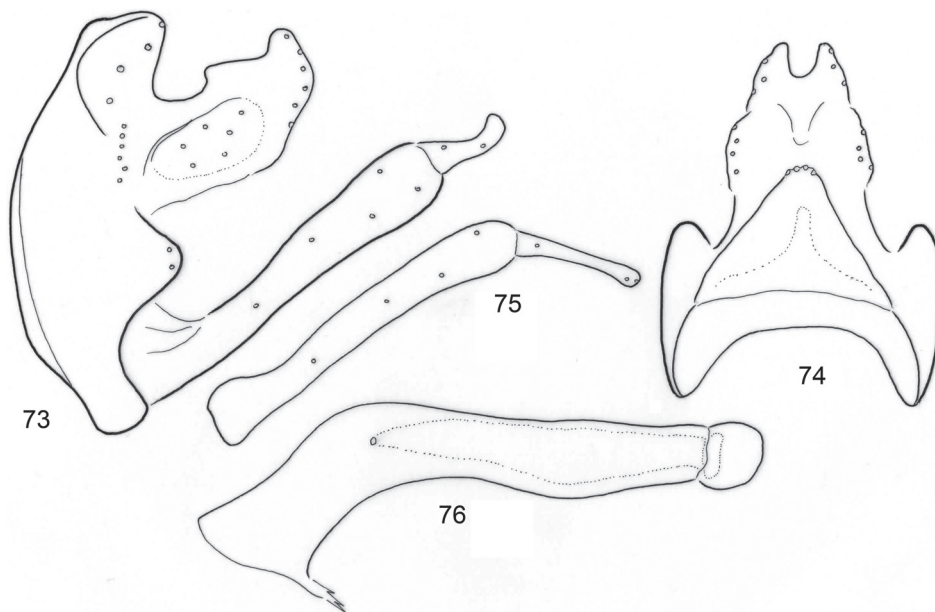
Diagnosis – This small species with marble spotted stramineous forewing apex has hindwing with close median cell and 1-2-3-5 fork present as well as asymmetric pretarsal claws on foreleg and abbreviated segment V of maxillary palp. This is the character state combination of the *H. unguolata* species group. Closest to *H. hosab* sp. n., but differs by having marbled spot pattern only on the apical half of the forewing; shorter segment IX, differently shaped intersegmental profile; lower phallobase; phallotremal sclerite vertically elongated, not rounded; abbreviated endothelial process.

Description – Male (in alcohol). Small sized stramineous animal. Wings ochraceous with lighter pubescence, with marble spotted pattern on the apical half of the forewing. Hindwing median cell present. Maxillary palp formula I-IV-III-II-V. Asymmetric pretarsal claws and abbreviated segment V of maxillary palp pronounced. Spur formula 2,4,4. Forewing length 7 mm.

Male genitalia. Segment IX fused annular and short; its median keel triangular with granulose dorsal surface; apical lobe on posterolateral margin triangular. Lateral intersegmental profile between ninth and tenth segments forming large rounded quadratic sinus. Segment X long and low; lateral setose area, cerci ovoid; dorsoapical setose lobes slightly upward curving in lateral and bilobed in dorsal view. Coxopodite of gonopod as long as apex of segment X, harpago broad, almost parallel-sided, capitate in ventral view. Phallic organ with obliquely downward turning phallobase, broad endophallus, pair of short and high phallosomal sclerite, that is vertically elongated, pair of abbreviated circular sclerotised endothelial process.

Type material – Holotype, male: Indonesia, Papua Barat, Birdshead Peninsula, Nimbokrang, 81 m, 4°07.983'S, 140°08.216'E, 23–28.V.2014, at light, leg. R. Horváth (1 male, OPC). Paratypes: same as holotype (3 males, OPC).

Etymology – *Kurtab*, from “kurtább”, shorter in Hungarian, refers to the shorter sclerotised endothelial process, compared to *H. hosab* sp. n.



Figs 73–76. *Hydropsyche kurtab* sp. n., holotype, male: 73 = genitalia in left lateral view, 74 = genitalia in dorsal view, 75 = gonopod in ventral view, 76 = phallic organ in left lateral view

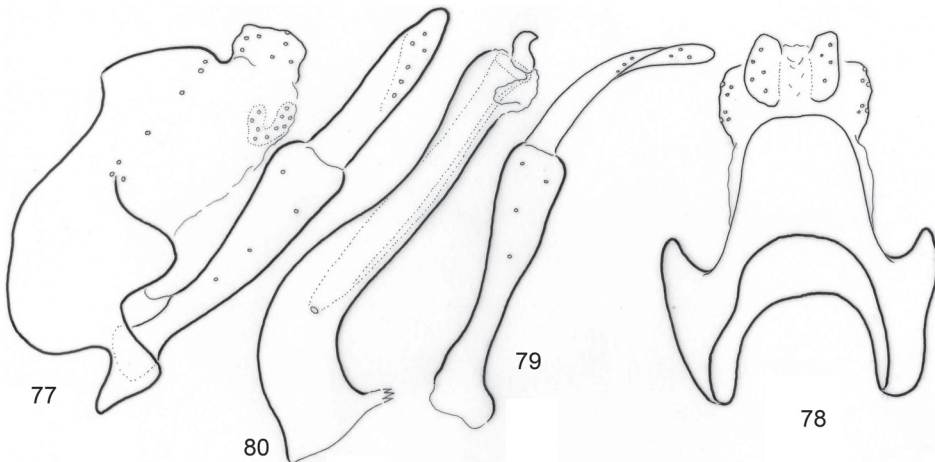
Hydropsyche lapos sp. n.

(Figs 77–80)

Diagnosis – This large species has small phallotremal sclerite at the tip of phallosome between a pair of sclerotised endothelial process and a membranous area with less sclerotised almost membranous lobes ventrally subapical. This character combination on the head of the phallic organ characterizes the *H. buergersi* species group. Closest to *H. tapena* Kimmins, 1957, described from Guadalcanal, the largest island of the Solomon Islands, but differs by having differently formed phallotremal and endothelial sclerite as well as the pair of apico-dorsal setose lobes quadrangular and projecting dorsad; the lateral setose area, the cerci has very specific crescent shape.

Description – Male (in alcohol). Large brown animal. Body brown, dorsal thoracic sclerites darker. Wings ochraceous with lighter pubescence, without pronounced pattern. Hindwing median cell present. Maxillary palp formula I-III-IV-II-V. Spur formula 2,4,4. Forewing length 15 mm.

Male genitalia. Segment IX fused annular and short; its median keel very broad with granulose dorsal surface, this broad keel representing the entire dorsum of segment IX shifted posteriad; apical lobe on posterolateral margin rounded triangular. Lateral intersegmental profile between ninth and tenth segments forming short and shallow excision. Segment X short and narrow; lateral setose area, cerci crescent-shaped and located near apical margin; dorsoapical setose lobes dominating on lateral profile of segment X as a pair of dorsad shifted



Figs 77–80. *Hydropsyche lapos* sp. n., holotype, male: 77 = genitalia in left lateral view, 78 = genitalia in dorsal view, 79 = gonopod in ventral view, 80 = phallic organ in left lateral view

quadrangular plate. Coxopodite of gonopod shorter than the apex of segment X, harpago broad almost parallel-sided in lateral view, twisted flat in ventral view. Phallic organ with high downward turning phallobase, broad endophallus touching dorsum of phallosheca, pair of vertically high phallosclerite, pair of S-shaped sclerotised endothelial process and membranous subapical region ventrally with laterad directed lobe.

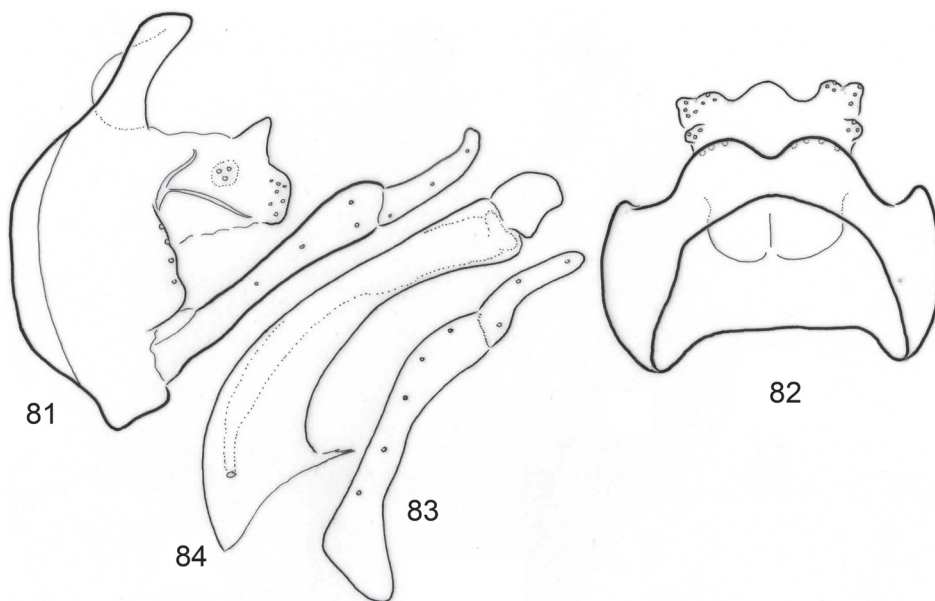
Type material – Holotype: Indonesia, Papua Barat, Birdshead Peninsula, Arfak Mountains, Mokwam, 1°06'S, 133°54'E, 1510 m, 6–10.XI.2011, at light, PIF Expedition. (1 male, NBC-ZMAN).

Etymology – *Lapos*, from “lapos”, flat in Hungarian, refers to vertically flattened harpago, the second segment of the gonopods.

***Cheumatopsyche arfakensis* sp. n.**

(Figs 81–84)

Diagnosis – This light brown animal with spotted forewing is a member of the *Cheumatopsyche expeditionis* species group and has similarity to *Cheumatopsyche tarka* Oláh, 2012 from Batanta Island, but differs by having intersegmental profile very high, apex of phallosheca not clavate, and ventral excision on the endothelial processes more pronounced.



Figs 81–84. *Cheumatopsyche arfakensis* sp. n., holotype, male: 81 = genitalia in left lateral view, 82 = genitalia in dorsal view, 83 = gonopod in ventral view, 84 = phallic organ in left lateral view

Description – Male (in alcohol). Cephalic and thoracic scerites brown, legs paler brown. Maxillary palp formula: I-(III,IV)-II-V. Spur formula 2,4,4. Forewing length 7 mm; forewing membrane with scattered light spots.

Male genitalia. IXth abdominal segment annular, tergum and ventrum very short; anterior margin convex; antecosta broad; apical lobe of posterior margin flat; spine row on posterior margin of segment IX limited to apical lobe; in dorsal view dorsoapical spiny lobes rounded almost semicircular and separated by rounded excision. Intersegmental lateral profile between segments IX and X very high. Segment X subquadratic both in dorsal and lateral view; basal part slightly sclerotised; setaless mesocaudal lobe produced rounded triangular in dorsal view, upright directed in lateral view; ventroapical setose lobe large, blunt in lateral view and slightly subdivided in dorsal view. Sutures of segment X visible behind cerci. Cerci forming elevated wart and located middle on the segment. Coxopodite of the gonopods extends beyond apex of segment X, straight rod-like in lateral view, slightly dilated at apex; harpago parallel-sided and slightly S-shaped in ventral view. Phallosome robust, basal section slightly broader and bent at obtuse angle to stem; ventral bulge straight subapical; endophallus long and broad, extending through and filling almost entire apical half of phallosome, ending anteriorly in narrow tube at gonopore; chitinised endothelial process slightly elongate, with ventral excision, strongly pigmented; phallosomal sclerite indistinctly round in lateral view.

Type material – Holotype, Indonesia, Papua Barat, Birdshead Peninsula, Nene Valley, Arfak, Benyas, 1°27'S, 134°01'E, 722 m, 17.XI.2011, leg. Papua Insect Foundation (1 male, NBC-ZMAN). Paratypes: same as holotype (2 males, NBC-ZMAN, 1 male, OPC). Indonesia, Papua Barat, Birdshead Peninsula, Arfak Mountains, Demaisi, 1°10'S, 133°53'E, 1637 m, 14.XI.2011, at light, leg. Papua Insect Foundation (2 males, OPC).

Etymology – *Arfakensis*, named after the type locality in the Arfak Mts.

Cheumatopsyche bunkoska Oláh et Mey, 2013

Examined material – Indonesia, Papua Barat, Birdshead Peninsula, Snow Mountains, Baliem Resort, 1947 m, 20 km from Wamena, 4°03.578'S, 139°01.747'E, 23–28.V.2014, at light, leg. R. Horváth (1 male, OPC).

***Cheumatopsyche elso* sp. n.**

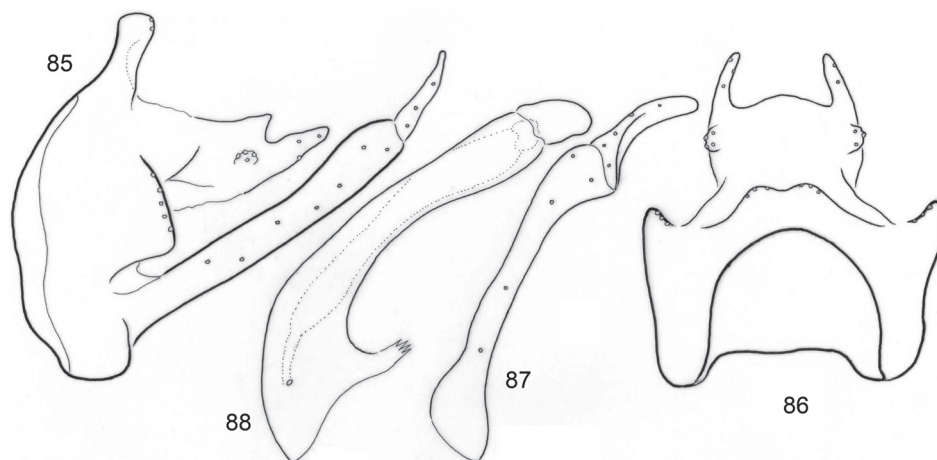
(Figs 85–88)

Diagnosis – This light brown animal with pale forewing without any pattern having very long apicoventral lobes with wide and deep interlobular gaps belongs to the *C. dubitans* species group of OLÁH & JOHANSON (2008). This grouping in the genus *Cheumatopsyche* Wallengren, 1891 is based primarily on the shape

formation of the fused segments X and XI and is rather practical, but artificial construct just for rapid determination of species into groups. *Cheumatopsyche* is a poorly studied speciose genus having almost 400 described species and an unknown number of unknown species, as well as many species lumped with several contemporarily diverged or diverging incipient species. This new species from the Arfak Mts has some resemblance to *C. wellsae* Dean, 2001 described from Northern Territory, Australia, but differs by having apicoventral lobes and harpagones differently shaped.

Description – Male (in alcohol). Cephalic and thoracic scerites brown, legs paler brown. Maxillary palp formula: I-IV-III-II-V. Spur formula 2,4,4. Forewing pale, length 7 mm; forewing membrane without any pattern.

Male genitalia. IXth abdominal segment annular, tergum and ventrum very short; anterior margin convex; antecosta broad; apical lobe of posterior margin flat, little downward produced; spine row on posterior margin of segment IX limited to apical lobe; in dorsal view dorsoapical spiny lobes less developed, less separated. Intersegmental lateral profile between segments IX and X very high. Segment X subquadrate both in dorsal and lateral view; basal part slightly sclerotised; setaless mesocaudal lobe slightly produced rounded in dorsal view, less directed upright in lateral view; ventroapical setose lobe long, strait in lateral, more slender, slightly mesad directed in dorsal view. Y-shaped sutures of segment X visible behind cerci, lower arm less distinct. Cerci forming elevated wart and located middle on segment. Coxopodite of gonopods extending well beyond apex of segment X, straight rod-like in lateral view, slightly dilated dorsad at



Figs 85–88. *Cheumatopsyche elso* sp. n., holotype, male: 85 = genitalia in left lateral view, 86 = genitalia in dorsal view, 87 = gonopod in ventral view, 88 = phallic organ in left lateral view

apex; harpago parallel-sided and broad based mesad in ventral view. Phallosome robust, basal section slightly broader and bent at obtuse angle to stem; little ventral bulge straight subapical; endophallus long and broad, extending through and filling almost entire apical half of phallosome, ending anteriorly in narrow tube at gonopore; chitinised endothecal process slightly elongated; phallosomal sclerite indistinctly round in lateral view.

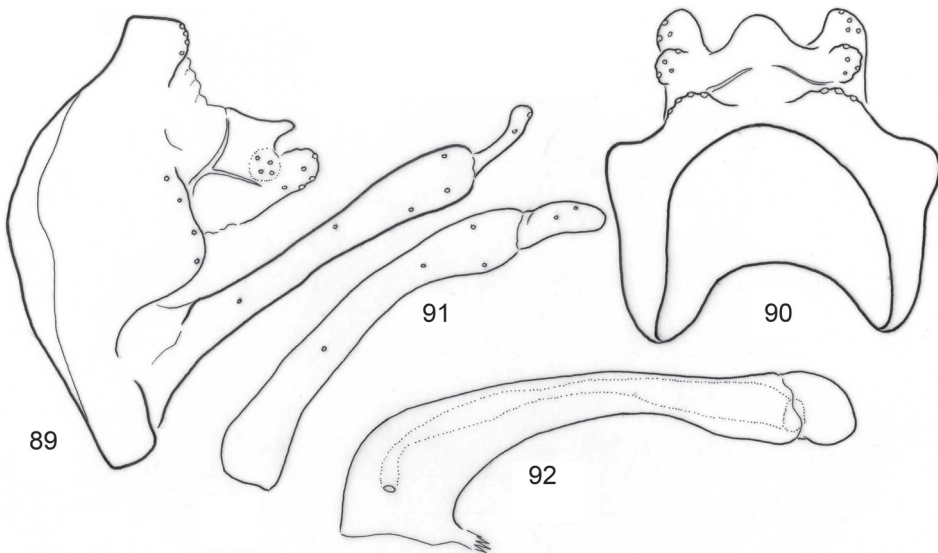
Type material – Holotype, Indonesia, Papua Barat, Birdshead Peninsula, Arfak Mountains, Mokwam, 1510 m, 1°06'S, 133°54'E, 722 m, 6–10.XI.2011, at light, PIF expedition (1 male, NBC-ZMAN).

Etymology – *Elso*, from “első”, first in Hungarian, refers to its relation to the *C. dubitans* species group, being the first representative in the New Guinea region.

***Cheumatopsyche vamosi* sp. n.**

(Figs 89–92)

Diagnosis – This marble spotted animal is a member of the *Cheumatopsyche expeditionis* species group and is most similar to *Cheumatopsyche ronujra* Oláh, 2012 from Batanta Island, but differs by having forewing spotted, not unicoloured; dorsocaudal spiny lobe of segment IX divided mesad, bilobed, not simple; ventroapical setose lobe of segment X large obliquely upward directed in lateral view, not horizontal; mesocaudal semicircular lobe almost as long as the ventro-



Figs 89–92. *Cheumatopsyche vamosi* sp. n., holotype, male: 89 = genitalia in left lateral view, 90 = genitalia in dorsal view, 91 = gonopod in ventral view, 92 = phallic organ in left lateral view

apical setose lobe, not shorter, interlobular gap wide by 3× the width of ventro-apical lobe, not 1.5×; harpago shorter.

Description – Male (in alcohol). Cephalic and thoracic sclerites brown, appendages including palps, antennae, legs light. Maxillary palp formula: I-III-IV-II-V. Spur formula 2,4,4. Forewing length 7 mm; membrane marble spotted; transparent hyaline line present on first half of stem of M1+2. Forewing SC and R running free to margin, Cu2 and A1 running free to margin, not confluent. Hindwing SC and R meeting at r; r preceding s, fork 1 absent.

Male genitalia. IXth abdominal segment annular, tergum and ventrum short; anterior margin convex; apical lobe of posterior margin rounded, well above lightly sclerotised articulation cavity of gonopods; antecosta medium-sized, gradually narrowing ventrad and dorsad with antecostal suture visible externally; spine row on posterior margin of segment IX with short break at segment X; dorsoapical margin spiny bilobed in dorsal view. Intersegmental lateral profile between segments IX and X low and obtuse angled. Segment X short, slightly trapezoid both in dorsal and lateral view; basal part slightly sclerotised, membranous, indistinct; terminating distally by well-produced setaless mesocaudal semicircular lobe; ventroapical setose lobe large rounded, obliquely upward directed. Vertical component of the Y-shaped sutures on segment X forming boundary between membranous basal and sclerotised apical parts. Cerci (lateral setose area) forming elevated circular wart shifted to setose ventropacial lobes. Coxopodite of gonopods extend well beyond apex of segment X, straight rod-like in lateral view, slightly dilated at apex in lateral view; harpago flattened in coronal plane; upward curving in lateral view, broader in ventral view. Phallosome robust, basal section slightly broader and bent at obtuse angle to stem; middle region slightly arched ventrad in lateral view, followed by constricted middle and apex broadening into ventral bulge; endophallus long and broad, extending through almost entire phallosome, ending anteriorly in narrow tube at gonopore; chitinised endothelial process strongly pigmented, rounded; phallosomal sclerite round in lateral view.

Type material – Holotype, male: Indonesia, Papua Barat, Birdshead Peninsula, Nimbokrang, 81 m, V. 2014, 4°07.983'S, 140°08.216'E, 23–28.V.2014, at light, leg. R. Horváth (1 male, OPC). Paratypes: same as holotype (4 males, OPC).

Etymology – This marble winged species is dedicated to Dr. Péter Vámosi who has initiated the collecting trip in which the holotype was collected.

Glossosomatidae

Agapetus gorbul Oláh et Mey, 2013

Examined material – Indonesia, Papua Barat, Birdshead Peninsula, Arfak Mountains, mountain top stream, 2149 m, 1°07.620'S, 133°44.333'E, 19.V.2014,

at light, leg. R. Horváth (2 males, OPC). Indonesia, Papua Barat, Birdshead Peninsula, Arfak Mountains, guesthouse, 1576 m, 1°05.875'S, 133°54.551'E, light trap at resort, 17.V.2014, leg. R. Horváth (1 male, OPC). Indonesia, Papua Barat, Birdshead Peninsula, Arfak Mountains, Mokuwam, 1510 m, 1°06'S, 133°54'E, 6–10.XI.2011, at light, PIF expedition (3 males, NBC-ZMAN).

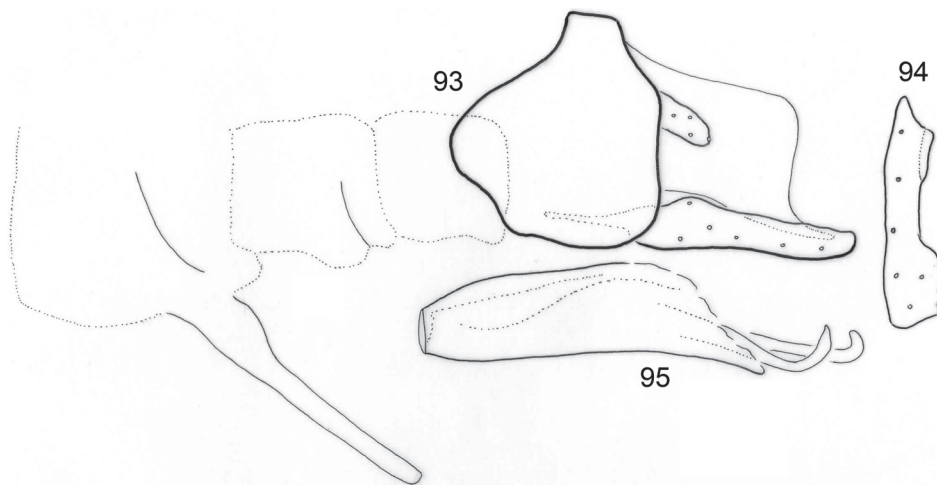
***Agapetus huzot* sp. n.**

(Figs 93–95)

Diagnosis – Close to *A. ulmeri* Ross, 1951 and *A. kivagot* Oláh, 2012, but sternum VI with longer apicoventral process; segment X with more produced apicoventral pointed end in lateral view; gonopods with more produced apicolateral end and with longer mesal flat elevation in lateral view; phallic organ with two asymmetric sclerotised hook-shaped process.

Description – Male (in alcohol). Brown animal, with legs and venter slightly lighter. Maxillary palp formula I-II-IV-V-III, second segment with globular mesolateral projection. Wing membrane brown; forewing length 4 mm; on hindwing Fork 1 lost, R1 vestigial. Spur formula 2,4,4. Blister-like protuberance on dorsal margin of sternite V present, detached from ridge; ventral process on sternite VI very long.

Male genitalia. Segment IX synsclerotised, short dorsad, long ventrad with straight posterior and convex, rounded triangular anterior in lateral view. Segment X membranous, indistinct, but discernible deeply excised in dorsal view. Cerci slightly elongate. Paraproctal lateral vertical plates (lateral lobe of segment X) produced ventroapicad into a pointed elongation. Gonopods low in lateral



Figs 93–95. *Agapetus huzot* sp. n., holotype, male: 93 = sterna IX, VIII, VII with ventral process and genitalia in left lateral view, 94 = gonopod in ventral view, 95 = phallic organ in left lateral view

view; produced apicolaterad and having long flat elevation on apicomesal margin in ventral view. Phallic organ with pair of asymmetric hook shaped paramere.

Type material – Holotype, Indonesia, Papua Barat, Birdshead Peninsula, Neney Valley, Arfak, Benyas, 1°27'S, 134°01'E, 722 m, 17.XI.2011, leg. Papua Insect Foundation (1 male, NBC-ZMAN).

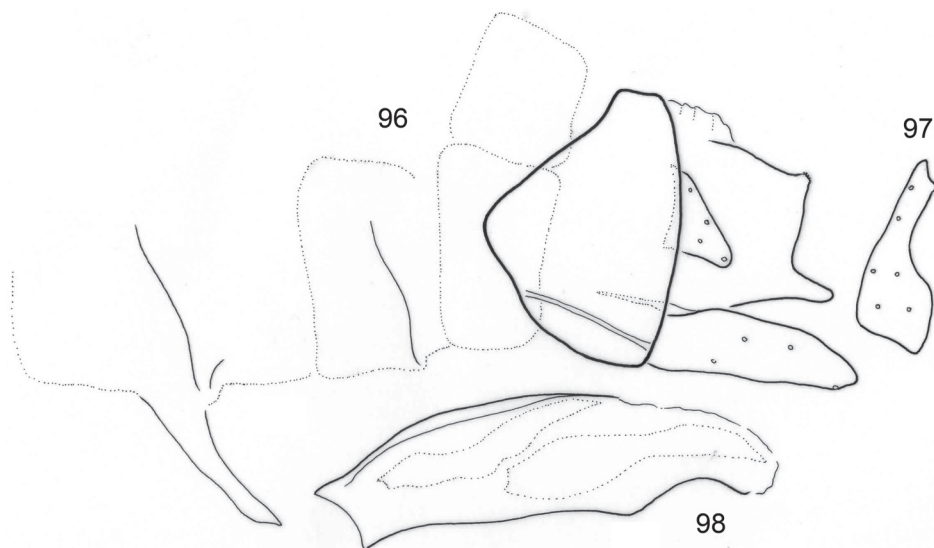
Etymology – *Huzot*, from “kihúzott”, drawn in Hungarian, refers to the laterad produced apical angle of the gonopods in ventral view as well as the produced or drawn ventroapical apices of segment X.

***Agapetus huzotas* sp. n.**

(Figs 96–98)

Diagnosis – Closest to *A. kihuzot* Oláh et Mey, 2013 described from Papua, Walmak, but sternum VI with more slender apicoventral process; segment X quadrangular with less produced apicoventral pointed process in lateral view; cerci triangular, not elongated; gonopods with more produced apicomesal outgrowth in ventral view; phallic organ with two asymmetric sclerotised internal elongated structures.

Description – Male (in alcohol). Brown animal, with legs and venter slightly lighter. Maxillary palp formula I-II-IV-V-III, second segment with globular mesolateral projection. Wing membrane brown; forewing length 4 mm; on hindwing



Figs 96–98. *Agapetus huzotas* sp. n., holotype, male: 96 = sterna IX, VIII, VII with ventral process and genitalia in left lateral view, 97 = gonopod in ventral view, 98 = phallic organ in left lateral view

Fork 1 lost, R1 vestigial. Spur formula 2,4,4. Blister-like protuberance on the dorsal margin of sternite V present detached from the ridge; ventral process on sternite VI slender.

Male genitalia. Segment IX synsclerotised, short dorsad, long ventrad with straight posterior and convex, rounded triangular anterior in lateral view. Segment X membranous, indistinct, but discernible, deeply excised in dorsal view. Cerci triangular. Paraproctal lateral vertical plates (lateral lobe of segment X) produced ventroapicad into pointed elongation. Gonopods low in lateral view; produced apicolaterad with small triangular apicomeral corner (outgrowth) in ventral view. Phallic organ with pair of large, sclerotised, elongate and irregular spine-like structures.

Type material – Holotype, Indonesia, Papua Barat, Birdshead Peninsula, Arfak Mountains, Mokwam, 1510 m, 1°06'S, 133°54'E, 6–10.XI.2011, at light, PIF expedition (1 male, OPC). Paratypes: same as holotype (1 male NBC-ZMAN, 1 male, OPC).

Etymology – *Huzotas*, from “húzottas”, drawn-like in Hungarian, reminds to its similarity to *A. kihuzot*.

***Agapetus sarkos* sp. n.**

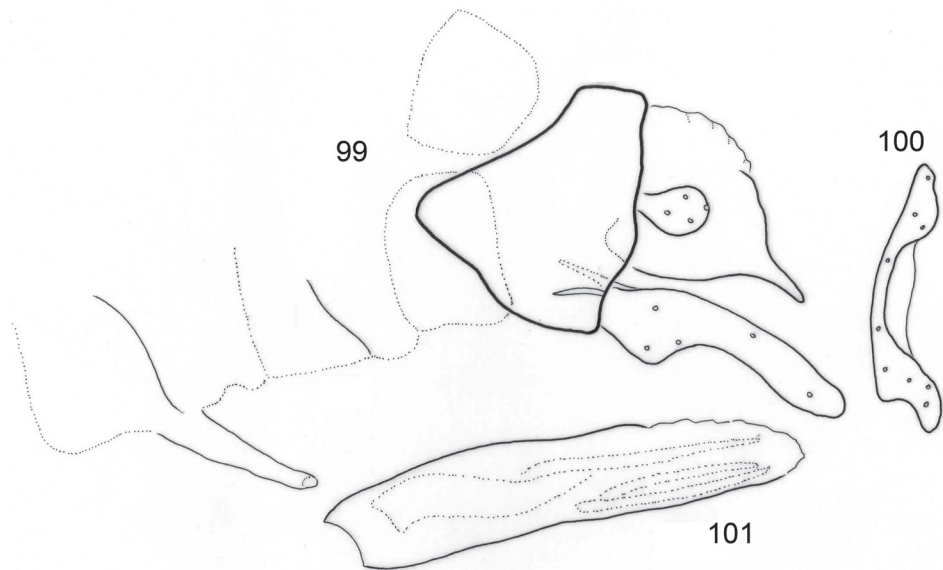
(Figs 99–101)

Diagnosis – Paraproct with its digitate terminal elongation in lateral view has similarity with *A. huzot* sp. n., *A. huzotas* sp. n., *A. kihuzot* Oláh et Mey, 2013, but differs from any known Australasian *Agapetus* Curtis, 1834 species by having well produced heel-shaped that is angular ventrobasal region on the gonopods.

Description – Male (in alcohol). Brown animal, with legs and venter slightly lighter. Maxillary palp formula I-II-IV-V-II, second segment with globular mesolateral projection. Wing membrane brown; forewing length 4 mm; on hindwing Fork 1 lost, R1 vestigial. Spur formula 2,4,4. Blister-like protuberance on dorsal margin of sternite V present detached from the ridge; ventral process on sternite VI very long.

Male genitalia. Segment IX synsclerotised, short dorsad, longer ventrad with straight posterior and triangular anterior in lateral view. Segment X membranous, indistinct, but discernible deeply excised in dorsal view. Cerci circular. Paraproctal lateral vertical plates (lateral lobe of segment X) produced ventroapicad into slender digitate elongation. Gonopods low with ventrobasal angular region in lateral view. Phallic organ with dark basal sclerite and with 3 straight spine-like slightly asymmetric long rods posterad.

Type material – Holotype, Indonesia, Papua Barat, Birdshead Peninsula, Arfak Mountains, Demaisi, 1°10'S, 133°53'E, 1637 m, 14.XI.2011, at light, leg. Papua Insect Foundation (1 male, OPC).



Figs 99–101. *Agapetus sarkos* sp. n., holotype, male: 99 = sterna IX, VIII, VII with ventral process and genitalia in left lateral view, 100 = gonopod in ventral view, 101 = phallic organ in left lateral view

Etymology – *Sarkos*, from “sarkos”, angular in Hungarian, refers to the produced heel-shaped ventrobasal region of the gonopods.

Lepidostomatidae

Lepidostoma hirtum branch

***Lepidostoma japonensis* new species complex**

Remarks – *Lepidostoma japonensis* KIMMINS (1962), one of the easternmost representatives of the family, was described from the Japen Island (Indonesia, Papua). We have a male and female specimen from the Arfak Mts (Indonesia, Papua) and collected a male specimen from the Batanta Island (Indonesia, Papua). A routine/superficial examination of the genital morphology would relate these specimens to *L. japonensis*, repeating again the popular slogan of the so called widely distributed and highly varying species with the usual range of variability in the shapes of the periphallic organs.

Divergence by speciation traits – Following the discovery of speciation trait (OLÁH *et al.* 2015), we have to distinguish clearly between the speciation traits, as non-neutral adaptive traits and the phenotypes of neutral, non-adaptive traits. In caddisflies the speciation traits are usually evolved on the intromittent organ

and the periphallallic organs are the neutral traits. This is confirmed by the rate of diversity pattern. The diversity gradient of highly diverse speciation traits and the less diverse periphallallic organ is the result of the sexual selection and stabilized by reproductive isolation.

Speciation traits could be the products of any selection pressure detectable in the early stages of speciation processes. However, the products of environmental selection triggered by abiotic or non-sexual social factors are seldom detectable as initial split criteria. The debated natural selection, the classical term as dubiously named (DARWIN 1859) and later compromised by DARWIN (1871) himself, requires more time to produce divergences, especially in sympatry. Fisher's fundamental theorem of natural selection is based on large mixed population where the rate of adaptation is limited by favourable mutations, as the only source of new variation as emphasized by Wright (FRANK 2012). Without reproductive isolation, the strong mechanisms of gene flow, genetic drift, recombination and mutation work against this environmental selection. In recent speciation research it was a shocking experience to learn that it is seldom possible to detect any non-sexually adapted traits in the early stages of divergence. Does the non-sexual natural selection work at all? Yes, but the non-sexually adapted traits must be coupled with one of the various mechanisms of reproductive isolation. However, this takes time! This is one of the reasons why the first morphological signs of divergence are detectable among the sexually selected speciation traits representing the first reproductive barriers. There are exceptions. If speciation events are seemingly rapid in phenotypic traits produced by non-sexual environmental selection (ecological selection = selection by environmental factors, a common scientific slang for non-sexual environmental selection) it is coupled with old intrinsic barriers. Complete or incomplete barriers to gene exchange might accumulate during periods when gene flow does not occur due to spatial or physical isolation (ABBOTT *et al.* 2013).

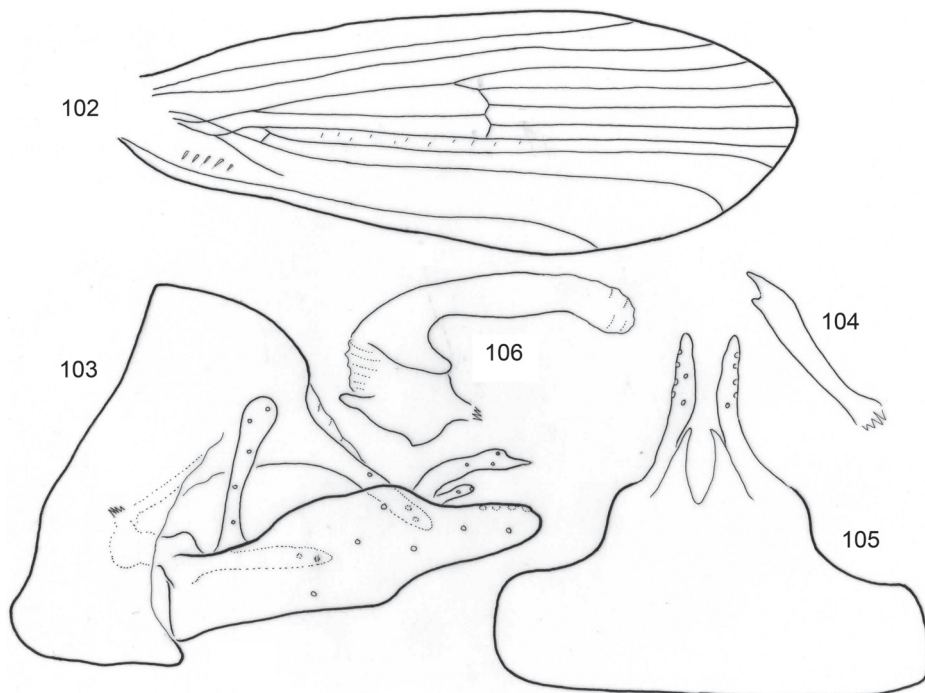
Sexually selected speciation traits in the L. japonensis species complex – This species complex belongs to the *Lepidostoma hirtum* branch characterized by the loss of the paramere. Parameres function frequently as stimulating, titillating, harming, or anchoring device in sexual selection processes. Other structures, usually the processes on aedeagus may enforce or even replace this function. If the paramere is lost and the aedeagus is simple, other structures, usually the paraproct takes over this function like in the genus *Annitella* Klapálek, 1907 (OLÁH *et al.* 2015). In *Triplectides* Kolenati, 1859 the diverged mesal lobes of the gonopods serving as a clasp for the movable harpago and the diverged setaless harpago are the product of sexual selection and the most stable and reliable structures to differentiate between species (OLÁH 2014). In the *L. japonensis* species complex without paramere and with a simple aedeagus the phallobase exhibit divergences together with the mesal subapical longer process, that is the harpago of the

gonopods, similarly the movable harpago of the genus *Triplectides*. Divergences have been found also in the female external genital structure, that is in the fused segments IX and X, and especially in the fine structures of the vaginal sclerite complex. Detailed comparative study on the fine structure of the vaginal sclerite complex is usually not practiced in Trichoptera taxonomy. It would need almost anatomical details and several specimens to establish trait stability. Having only a single female specimen this substantial information on divergence, coded by multitude of quantitative trait loci, was not described. Divergences evolved also in the sexually dimorphic male forewing and in the neutral trait of the gonopods.

***Lepidostoma arfaka* sp. n.**

(Figs 102–108)

Diagnosis – This new species is closer to *L. japonensis* Kimmins, 1962 than to *L. batanta* sp. n., but differs from both by having the longer subapical mesal process (harpago) of the gonopods bifid and the ventral tip is very pointed; the pair of inner branches of segment X produced long spine-like with pointed apex,



Figs 102–106. *Lepidostoma arfaka* sp. n., holotype, male: 102 = forewing venation, 103 = genitalia in left lateral view, 104 = the longer subapical mesal process (harpago) of the gonopods in dorsal view, 105 = IX and X segments of the genitalia in dorsal view, 106 = phallic organ in left lateral view

not short triangular lobe of *L. japenensis* and not reduced to a circular surface of *L. batanta* sp. n.; on male forewing anal vein is not enlarged thick.

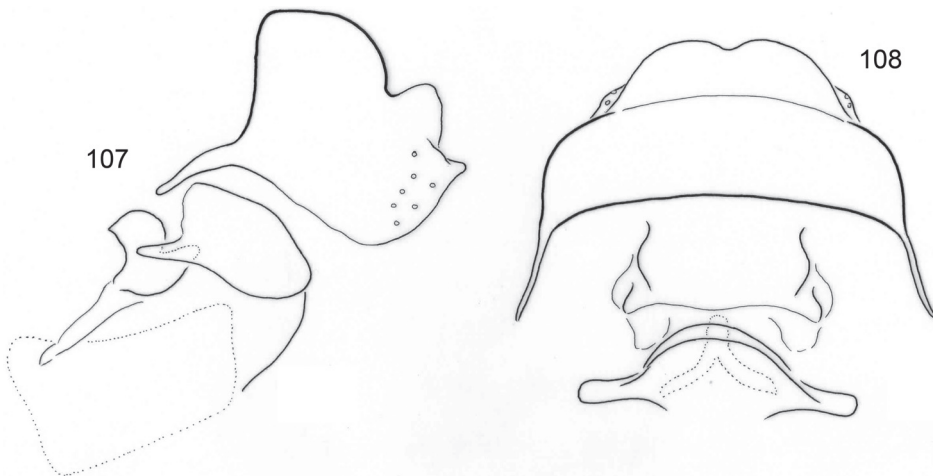
Description – Male (in alcohol). Medium-sized tawny animal. Second maxillary palp segment directed upwards at right angles, three times as long as the basal segment. Scape cylindrical. Spur formula 2,4,4. Forewing length 9 mm.

Male genitalia. Segment IX fused annular, dorsum and venter with nearly equal length. Segment X quadrifid, outer branches long slender, slightly tapering. Cercal setose area indistinct. Paraproct indistinct, fused to ventrum of segment X. Gonopods about twice as long as widest in middle, constricted in its apical third with bunch of stout setae; basodorsal process upward, basomesal process posterad directed; longer subapical mesal process, harpago bifid, ventral tip more produced, pointed. Phallic organ without parameres; phallobase with finger-like process in lateral view.

Female genitalia. Fused female segments IX and X as well as vaginal sclerite complex differently shaped as compared to *L. japenensis*.

Type material – Holotype, Indonesia, Papua Barat, Birdshhead Peninsula, Arfak Mountains, Mokwam, 1510 m, 1°06'S, 133°54'E, 722 m, 6–10.XI.2011, at light, PIF expedition (1 male, NBC-ZMAN). Paratypes: same as holotype (1 female, NBC-ZMAN). Indonesia, Papua Barat, Birdshhead Peninsula, Arfak Mountains, 2149 m, 1°07.620'S, 133°44.333'E, 19.V.2014, leg. R. Horváth (1 male, OPC). Indonesia, Papua Barat, Birdshhead Peninsula, Arfak Mountains, guest-house, 1576 m, 1°05.875'S, 133°54.551'E, 20.V.2014, light trap at resort spring leg. R. Horváth (4 males, OPC).

Etymology – *Arfaka*, named after the type locality in the Arfak Mts.



Figs 107–108. *Lepidostoma arfaka* sp. n., allotype, female: 107 = genitalia with the vaginal sclerite complex in left lateral view, 108 = genitalia with the vaginal sclerite complex in dorsal view

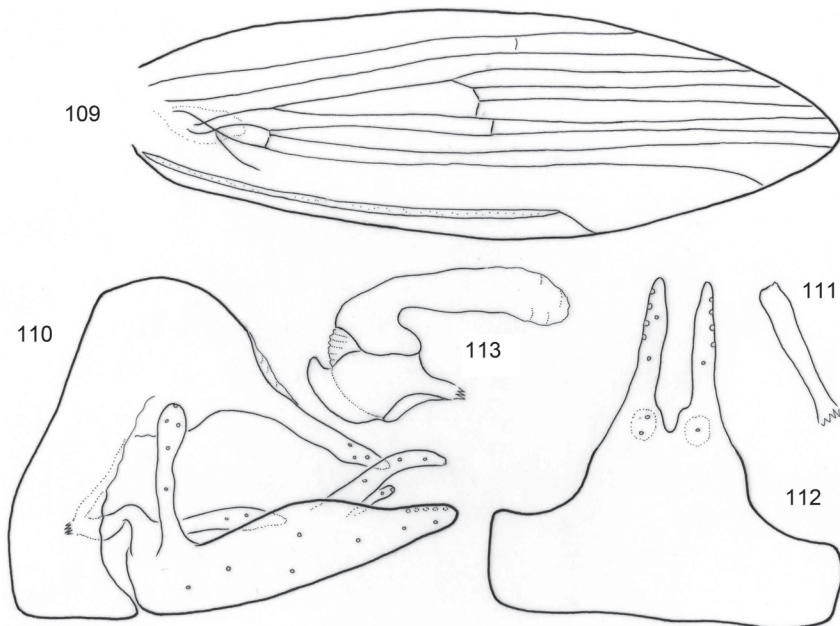
Lepidostoma batanta sp. n.

(Figs 109–113)

Diagnosis – This new species differs from both *L. japonensis* Kimmins, 1962 and *L. arfaka* sp. n. by having harpago with a single tiny pointed tip, inner branches of segment X reduced to a rounded surface; phallobase low and supplied with a produced anterior rim; gonopod ventrum straight, not constricted; male forewing pointed, not rounded.

Description – Male (in alcohol). Medium-sized tawny animal. Second maxillary palp segment directed upwards at right angles, three times as long as basal segment. Scape cylindrical. Spur formula 2,4,4. Forewing length 8 mm.

Male genitalia. Segment IX fused annular, dorsum longer than ventrum. Segment X bifid, inner branches reduced to circular surface, outer branches long slender, slightly tapering. Cercal setose area indistinct, probably represented by circular surface. Paraproct indistinct, fused to ventrum of segment X. Gonopods about three times as long as widest in subapical, constricted only on its dorsal apical third, with bunch of stout setae; basodorsal process upward, basomesal process posterad directed; longer subapical mesal process, harpago with tiny pointed tip. Phallic organ without parameres; phallobase with produced vertical rim anterior in lateral view.



Figs 109–113. *Lepidostoma batanta* sp. n., holotype, male: 109 = forewing venation, 110 = genitalia in left lateral view, 111 = the longer subapical mesal process (harpago) of the gonopods in dorsal view, 112 = IX and X segments of the genitalia in dorsal view, 113 = phallic organ in left lateral view

Type material – Holotype, Indonesia, Papua, Batanta Island, Teluk Warai stream, 0°50'51.0"S, 130°35'14.0"E, 11.II.2015, light, leg. T. Kovács & P. Juhász (1 male, OPC).

Etymology – *Batanta*, named after the type locality of the Batanta Island.

Calamoceratidae

Anisocentropus hyboma Neboiss, 1986

Examined material – Indonesia, Papua Barat, Birdshead Peninsula, Tamrau Plateau, Senopi, 0°50'S, 132°55'E, 476 m, 21–22.XI.2011, leg. Papua Insect Foundation (1 male, NBC-ZMAN).

Remarks – We have collected a single male specimen of this nice species in a light trap on the Waigeo Island, Orobai River (OLÁH 2012b).

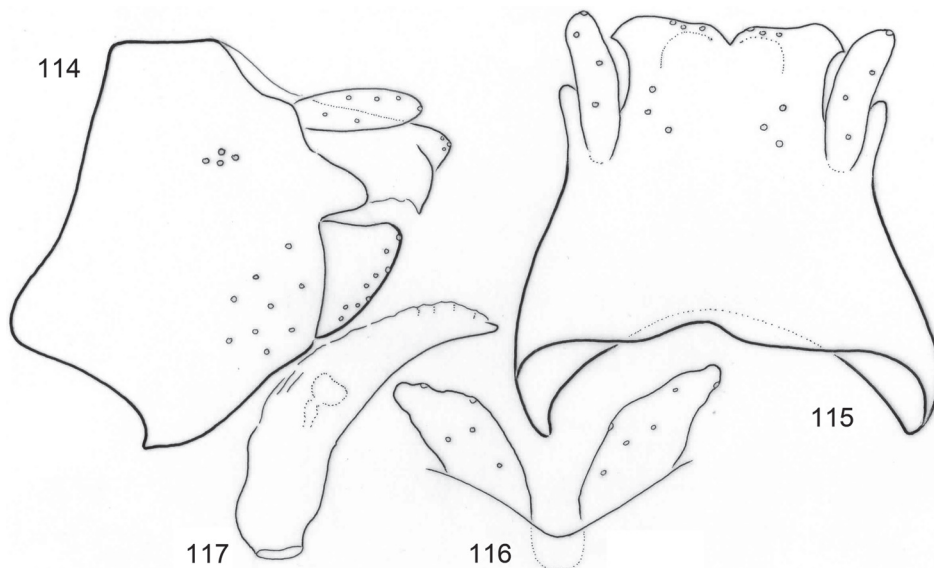
Anisocentropus mentes sp. n.

(Figs 114–117)

Diagnosis – This large sized pale yellowish species with elongated wings has entirely yellow forewing, without any sign of wing pattern, at least in the alcohol. Large size, long and unicolor forewing resemble members of the genus *Ganonema* McLachlan, 1866, however the male genital structure clearly relates this new species to the *Anisocentropus* (*Anisocentropus*) *latifascia* species group of OLÁH & JOHANSON (2010).

Description – Male (in alcohol). Large-sized species with yellowish wing membrane; with pale brownish maxillary palp, vertex, thorax dorsum and with yellow antennae, labial palps, underparts including legs. Ocelli absent. Maxillary palp formula II-VI-IV-I-V-III. Spur formula 2,4,3. Forewing length 15 mm, forewing membrane yellowish, unicoloured, without any pattern, forewing elongate.

Male genitalia. Segment IX fused annular, tergum shorter than ventrum; anterior margin triangular, shifted a little ventrad of middle; the entire posterior margin with well-developed lateral flank between cerci and gonopods; apical half of this flank glabrous, less pigmented, slightly transparent; small isolated group of setae present middle behind flank; more setae present ventroapical. Intersegmental depression between segment IX and segment X oblique. Segment X much longer than gonopods forming broad hood with downward and laterad directed apical pointed tip; interlobular gap V-shaped. Cerci elongate. Gonopods one segmented, without harpago, blunt triangular in lateral view. Phallic apparatus a curving tube, as a result slightly convex basad and concave ventrad with elongate more sclerotised ventral apical lobe, above this ventral lobe only part of aedeagus visible in its intruded state; a phallosomal sclerite visible in lateral view as large compact structure in membranous aedeagus, ejaculatory duct indiscernible.



Figs 114–117. *Anisocentropus mentes* sp. n., holotype, male: 114 = genitalia in left lateral view, 115 = genitalia in dorsal view, 116 = gonopods in ventral view, 117 = phallic organ in left lateral view

Type material – Holotype, Indonesia, Papua Barat, Birdshead Peninsula, Arfak Mountains, Mokwam, 1510 m, 1°06'S, 133°54'E, 722 m, 6-10.XI.2011, at light PIF expedition (1 male, NBC-ZMAN). Probable associated female, same as holotype (1 female, NBC-ZMAN).

Etymology – *Mentes*, from “mentes”, without in Hungarian, refers to the yellow unicoloured forewing without any pattern.

Leptoceridae
Triplectidinae

Symphitoneurina fulva (Navás, 1932)

Symphitoneuria fulva NAVÁS, 1932: 153–154.

Symphitoneurina fulva: SCHMID (1949): 363–365.

Examined material – Indonesia, Papua Barat, Arfak Mts. Maripi, 112 m, 0°55'S, 133°58'E, 19.XI.2011, leg. Papua Insect Foundation (1 male, OPC).

***Triplectides haram* sp. n.**

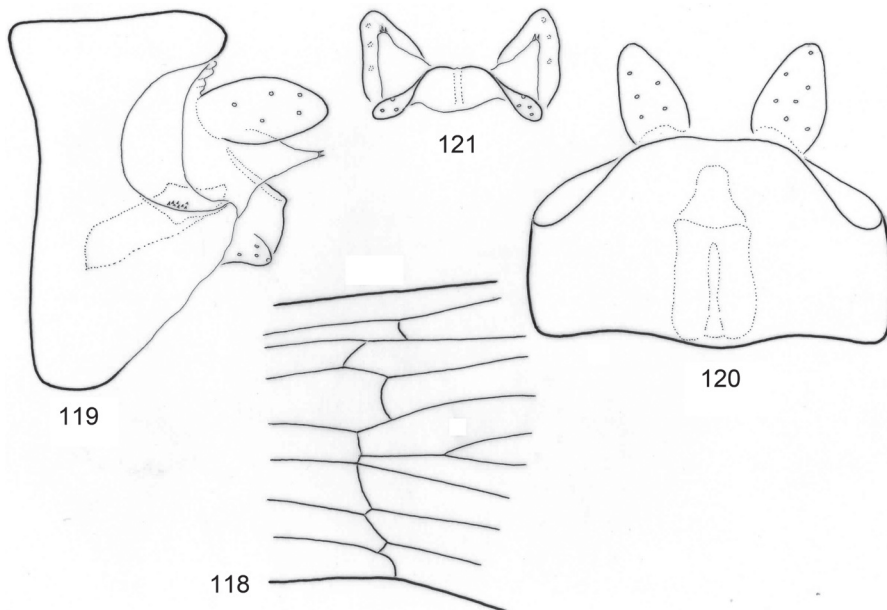
(Figs 118–121)

Diagnosis – This beautiful female specimen represents a species belonging to the *T. australis* species group. Its setose dorsal lobes and the sensilla-bearing

lobes differ from all the known species. The five Australian species in this group are all viviparous. The female holotype of this species contained 28 first-instar larvae found between segment VIII and the gonopods plate. This species group was formerly known from Australia with five species. The distribution of two species, *T. australis* Navás, 1934 and *T. magnus* (Walker, 1852) is uncertain (MORSE & NEBOISS 1982). The species recorded under the name of *T. australis* or *T. magnus* outside Australia probably represent many new species. This species group seems very species-rich throughout eastern Asia. The discovery of less variable non-neutral adaptive speciation traits (Oláh *et al.* 2015) may help us to find hiding species. YANG & MORSE (2000) described three new species from China. OLÁH & MEY (2013) and OLÁH (2014) described already five new species from New Guinea.

Description – Male (in alcohol). Large brown animal. Body brown, dorsal thoracic sclerites darker. Wings brown, without pronounced pattern. Maxillary palp formula I-IV-II-III-V. Spur formula 1,2,2. Forewing length 12 mm.

Female genitalia. Tergum IX produced posterad large plate with rounded apical margin; pleural region produced large concavities covered with densely packed microtrichiae. Setose dorsal lobe short and broad ovoid both in dorsal and lateral view. Sensilla-bearing lobes of MORSE & NEBOISS (1982) (we believe these structures are vestigial tergite X) are triangular both in lateral and ventral view bearing



Figs 118–121. *Triplectides haram* sp. n., holotype, female: 118 = forewing venation of anastomosis, 119 = genitalia with vaginal sclerite complex in left lateral view, 120 = genitalia with vaginal sclerite complex in dorsal view, 121 = genitalia in ventral view

a few terminal setae. Lamellae, sternum of segment X, upper vulvar lip with pair of lateral setose lobe and glabrous mesal sinus forming dorsal or upper vulvar lip of vaginal entrance. Fused gonopods glabrous without any conspicuous transversal striae. Basal plate of vaginal sclerite complex, representing anterior half of sclerotised complex longitudinally subrectangular. Hood-shaped junction sclerite narrowing posterad. Junction sclerite holding and stretches junction where ducts of accessory gland and ovarium meet as well as separating accessory duct from spermathecal duct. Spermathecal process visible as middle line window widening anterad; this substructure on ventrum of basal plate receiving ductus spermathecae and forming frequently longitudinal keel on ventrum of vaginal sclerite.

Type material – Holotype: Indonesia, Papua Barat, Birdshead Peninsula, Tamrau Plateau, Senopi, 0°50'S, 132°55'E, 476 m, 21–22.XI.2011, leg. Papua Insect Foundation (1 female, NBC-ZMAN).

Etymology – *Harom*, from “háromszög”, triangle in Hungarian, refers to the triangular shape of lateral lobes of tergum X.

Triplectides oblos Oláh et Mey, 2013

Examined material – Indonesia, Papua Barat, Birdshead Peninsula, Snow Mountains, Baliem Resort, 1947 m, 20 km from Wamena, 4°03.578'S, 139°01.747'E, 23–28.V.2014, at light, leg. R. Horváth (4 males, OPC).

Leptocerinae

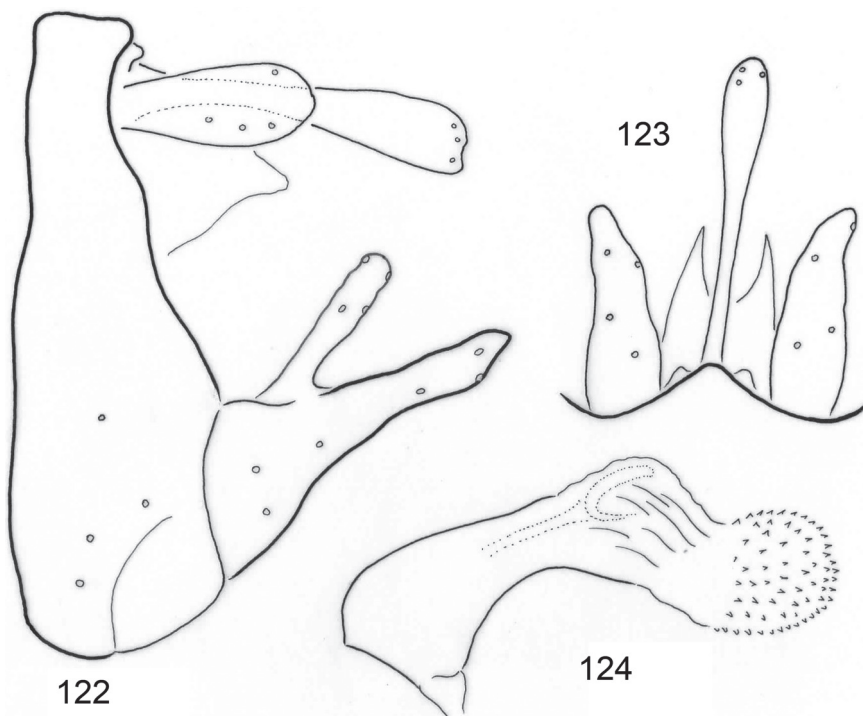
***Oecetis veforma* sp. n.**

(Figs 122–124)

Diagnosis – Having symmetrical phallic organ without parameres, this new species is related to *O. arctipennis* Kimmins, 1962 and *O. kimminsi* Kumanski, 1979, but differs from both by the V-shaped gonopods.

Description – Male (in alcohol). Pale, yellowish animal. Wing membrane yellow without any pattern, just crossveins in anastomosis have some brown pigment; forewing length 9 mm.

Male genitalia. Segment IX synsclerotised, shorter dorsad, longer ventrad; dorsoapical margin with pair of small triangular lobes; ventroapical region slightly concave glabrous. Segment X consisting of a slender median process, slightly clavate accompanied ventrally by a pair of very transparent just discernible lateral plates. Cerci fused to segment IX, foliate. Gonopods bilobed, V-shaped, dorsal arm visible only in lateral view. Phallic organ symmetrical with sclerotised phaloteca, striated middle and terminating in circular bilobed head fully filled with tiny microtrichae.



Figs 122–124. *Oecetis veforma* sp. n., holotype, male: 122 = genitalia in left lateral view, 123 = genitalia in dorsal view, 124 = phallic organ in left lateral view

Type material – Holotype: Indonesia, Papua Barat, Birdshhead Peninsula, Neney Valley, Arfak, Benyas, 1°27'S, 134°01'E, 722 m, 17.XI.2011, leg. Papua Insect Foundation (1 male, NBC-ZMAN).

Etymology – *Veforma*, from “véforma”, V-shape in Hungarian, refers to the branched gonopods.

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