

## New species and records of Balkan Trichoptera III.

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**ABSTRACT:** We report 113 caddisfly species from Albania, Bosnia & Herzegovina, Bulgaria, Croatia, Greece, Macedonia, Montenegro, Serbia, and Slovenia. Ten new species are described: *Wormaldia busa* Oláh sp. n., *W. daga* Oláh sp. n., *W. graeca* Oláh sp. n., *W. homora* Oláh sp. n., *Tinodes karpathos* Oláh sp. n., *Hydropsyche sarnas* Oláh sp. n., *Annitella jablanicensis* Oláh sp. n., *Allogamus zugor* Oláh sp. n., *Potamophylax alsos* Oláh sp. n., and *Beraea gurba* Oláh sp. n. Two unknown females are described: *Potamophylax kesken* Oláh, 2012, and *P. tagas* Oláh et Kovács, 2012. The *Potamophylax tagas* species cluster is revised by fine structure analysis of the cluster divergence, including cluster history, probable speciation, divergence between sibling pairs, as well as gonopod, paramer, aedeagus, and vaginal sclerite divergences.

### Introduction

Data and information on the Balkan Trichoptera, especially from Albania, Macedonia Montenegro and Serbia is still very limited in spite of the very high diversity in these countries. High elevation habitats in several mountain ranges are significant endemic hotspots. Our annual field work, although very limited, is producing every year new distributional data and new species (OLÁH 2010, 2011; OLÁH & KOVÁCS 2012a,b, 2013; OLÁH et al. 2012, 2013a,b, 2014). Both spring and autumnal collecting trips were financed by The Sakertour Eastern Europe, the Birdwatching and Hide Photography Company of the Carpathian Basin and Danube Delta. We have applied the collecting, processing, clearing, cleaning and drawing methods described by OLÁH (2011). The new method and nomenclature developed for the detailed examination and drawing of the vaginal sclerite complex of the female genitalia were described and further developed by OLÁH et al. (2013a, 2014).

**Abbreviations:** BM = Mihaela Beshkova, BS = Stoyan Beshkov, BZ = Zoltán Barina, DL = László Dányi, FZ = Zoltán Fehér, JP = Péter Juhász, KaT = Tomislav Karanovic, KJ = Jenő Kontschán, KT = Tibor Kovács, MD = Dávid Murányi, MG = Gábor Magos, PD = Dániel Pifkó, PG = Gellért Puskás, PV = Vladimír Pešić, SzG = Gergely Szövényi, SzT = Tímea Szederjesi; HNHM = Hungarian Natural History Museum (Budapest), NMNHBAS = National Museum of Natural History, Bulgarian Academy of Sciences (Sofia), OPC = Oláh Private Collection under national protection of the Hungarian Natural History Museum, Budapest.

### Results

#### PHILOPOTAMIDAE Stephens, 1829

*Philopotamus achemenus* Schmid, 1959 – Greece, South Aegean, Naxos regional unit, Koronis, occupied brook N of the village, N37°06.857', E25°32.077', 620 m, 06.04.2013, KJ-MD-SzT (1♂, HNHM).

*Philopotamus montanus* (Donovan, 1813) – Macedonia, Polog region, Šar Planina, Bozovce, open brook W of the village, N42°02.759', E20°47.776', 1545 m, 24.06.2014, JP-KT-MD (3♂, 2♀, OPC). Polog region, Šar Planina, Bozovce, forest stream W of the village, N42°02.755', E20°47.723', 1565 m, 24.06.2014, JP-KT-MD (4♂, 3♀,

OPC). Polog region, Šar Planina, Brodec, Tetovska Reka (Pena) in the village, N42°03.375', E20°53.561', 980 m, 24.06.2014, JP-KT-MD (4♂, 2♀, OPC). Southwestern region, Jablanica Mts, Labuništa, open brook W of the city, N41°16.069', E20°31.242', 1905 m, 26.06.2014, JP-KT-MD (1♂, 3♀, OPC).

### *Wormaldia* genus

The genus *Wormaldia* is in need of a detailed comparative examination and revision in the Palaearctic Region (MALICKY 2005). Attempts to revise the diverse *Wormaldia occipitalis* species complex with comparative analysis of endothecal spine pattern is planned in several laboratories, but still failed to complete. The highly diverse endothecal spine pattern is a direct indication of its primary function in copulation and sexual selection processes. However, there are other structures under rapid sexual selection besides the diverged (already stable) or diverging (still variable) endothecal spine pattern. The fine structure (visible only under higher magnification!) on the apical region of segment X has also direct function in precopulation and copulation processes. This region behind or beyond the dorsal subapical pointed process or depression on the dorsum of segment X is densely covered with sensory structures of *sensilla basiconica* (pegs) or *s. coeloconica* (pitted pegs). These are basiconic pegs or cones that are positioned in shallow pits and innervated by two to several neurons.

*Wormaldia asterusia* Malicky, 1972 – Greece, Crete, Rethymno regional unit, Axos, spring S of the village, N35°17.934', E24°50.485', 590 m, 02.04.2013, KJ-MD-SzT (3♂, 1♀, HNHM).

*Wormaldia bulgarica* Novák, 1971 – Bulgaria, Blagoevgrad province, Belasica Mts, Petrič, spring of Lesniska Stream SW of the city, N41°21.021', E23°10.767', 1025 m, 05.05.2014, KT-MD (1♂, 2♀, OPC).

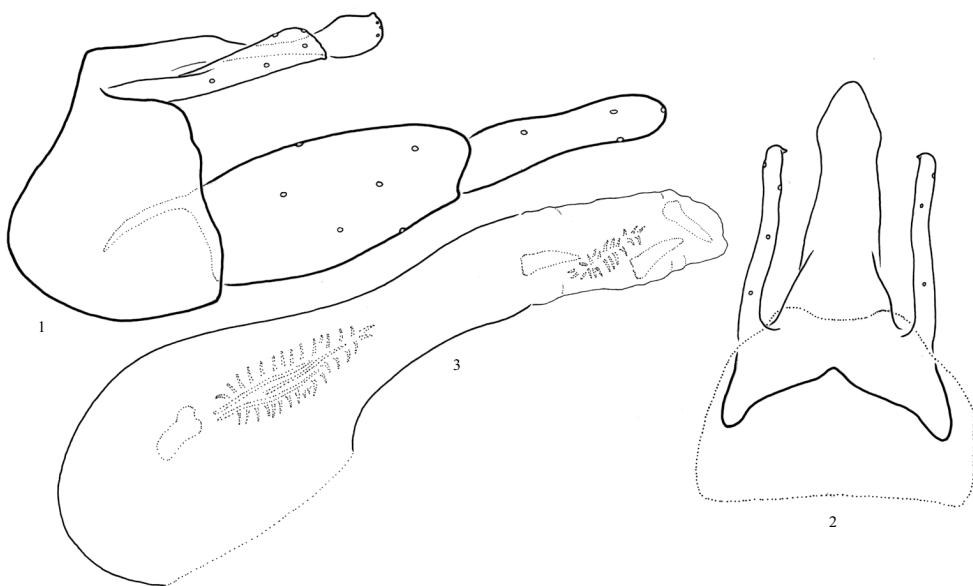
### *Wormaldia busa* Oláh sp. n. (Figs 1–3)

*Diagnosis* – A species with characteristic endothecal spine clusters similar to the *Wormaldia khourmai*, *W. bulgarica* and *W. balcanica* group of species, and closest to *W. balcanica*, but differs by having more slender gonopod, harpagones clavate not narrowing; apical head of segment X without subapical pointed process, but with dorsoapical projection in lateral view; cerci with a ventromesal pointed tooth just visible, not produced.

*Description* – Male (in alcohol). Small castanean brown animal. Sclerites medium brown, setal warts both on head and thorax and legs brown. Maxillary palp formula is I-II-IV-III-V. Forewing length 4 mm. Spur formula is 244.

Male genitalia. Tergit VIII with very shallow, just discernible mesal excision on the apical margin. Segment X characterized by triangular apex in dorsal view, in lateral view without pointed dorsal subapical tooth, but with minute dorsoapical terminal projection, by well discernible middle depression and without basolateral pair of conspicuous flange of sclerite. Cerci with obliquely truncate apex. Gonopods, both coxopodite and harpago elongated slender; harpagones having slightly club-shaped apex and slightly shorter than coxopodite. Phallic organ with eversible membranous endotheca containing three stout spines, as well as long basal and shorter subapical cluster of small spines; basal cluster composed of very thin and long longitudinal filaments and peripheral short transversal spines.

*Type material* – Holotype. Greece, South Aegean, Rhodes regional unit, Apollona, Triana, stream in a gorge with plane trees, N36°15.261', E27°55.157', 315 m, 09.11.2012, KJ-MD (1♂, HNHM).



**Figs 1–3.** *Wormaldia busa* Oláh sp. n. male holotype: 1 = genitalia in lateral view; 2 = segment X and cerci in dorsal view; 3 = phallic organ in left lateral view

*Etymology* – *busa*, from “busa, busakos”, club-shaped, clavate, thicker at the apex than at base in Hungarian, refers to the apex of the harpagones, slightly dilated, not narrowing or tapering.

*Wormaldia charalambi* Malicky, 1980 – Greece, Thrace, Rhodope peripheral unit, Sapka Mts, Kizario, stream and pasture SW of the village, N41°03.492', E25°45.672', 140 m, 27.05.2012, KJ-MD-SzT (1♂, OPC). Thrace, Rhodope peripheral unit, Sapka Mts, Nea Sanda, open brook and pasture NE of the village, N41°07.965', E25°54.052', 790 m, 26.05.2012, KJ-MD-SzT (6 associated ♀, OPC).

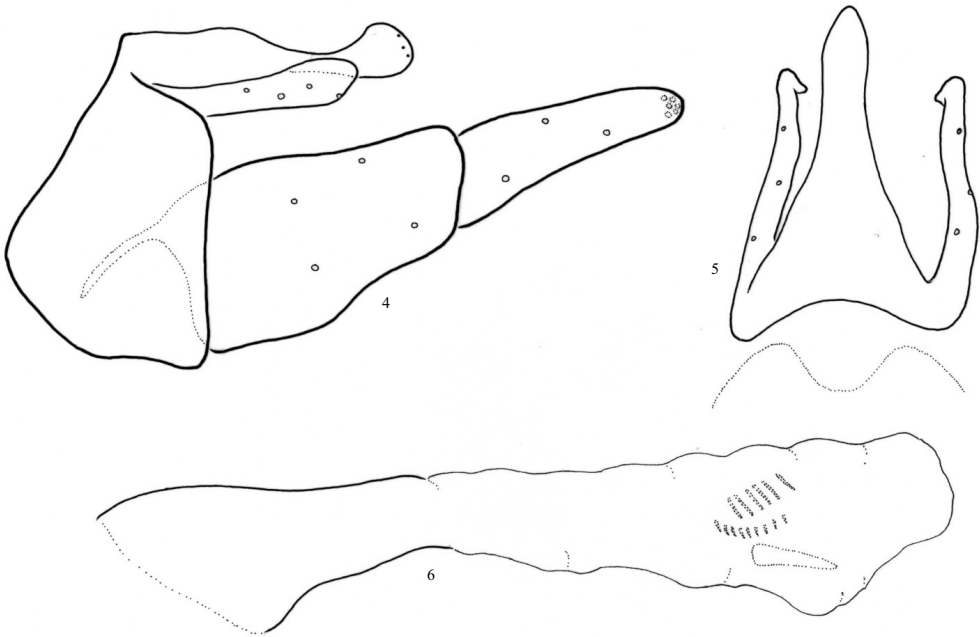
#### *Wormaldia daga* Oláh sp. n. (Figs 4–6)

*Wormaldia khourmai* Schmid, 1959 ssp. ? – KUMANSKI (1979): 62–63.

*Diagnosis* – We have collected *Wormaldia khourmai* Schmid, 1959 on the Thales slopes near to the *locus typicus*: Iran, Thales Mts, Masula River, 12.08.1990, J. Oláh (3♂, OPC). The most important genital structures involved in sexual selection, the endotheal spine pattern and the the head of segment X are clearly different. This species with charactersitic endotheal spine clusters and narrowing harpagones belongs to the *W. khourmai*, *W. bulgarica*, *W. balcanica*, *W. mahiri* and *W. erzincanica* group of species and most close to *W. khourmai*, but differs by having more swollen apex of segment X, rounded, not truncate apex of cerci and only a single endotheal spine, not three spines.

*Description* – Male (in alcohol). Small castanean brown animal. Sclerites medium brown, setal warts both on head and thorax and legs brown. Maxillary palp formula is I-II-IV-III-V. Forewing length 4 mm. Spur formula is 244.

Male genitalia. Tergit VIII with deep mesal excision on the apical margin. Segment X characterized by elongated apex in dorsal view; rounded swollen apex in lateral view with



**Figs 4–6.** *Wormaldia daga* Oláh sp. n. male holotype: 4 = genitalia in lateral view; 5 = segment X and cerci together with anterior margin excision of tergite VIII in dorsal view; 6 = phallic organ in left lateral view

well discernible middle depression and without basolateral pair of conspicuous flange of sclerite. Cerci with rounded apex in lateral view and with a mesal subapical projection in dorsal view. Gonopods, both coxopodite and harpago elongated slender; harpagones having slightly narrowing apex and slightly shorter than coxopodite. Phallic organ with eversible membranous endotheca containing only a single stout spines, the cluster complex composed of a row with longer and a row of shorter spines.

*Type material* – Holotype. **Bulgaria**, Bosna Mts, Dudenovo, Dudenska Reka, between Vizitza and Novo Panicharevo, N42°10'25", E27°34'07", 249 m, 26.07.2012, at light, S. Beshkov, M. Beshkova (1♂, NMNHBAS).

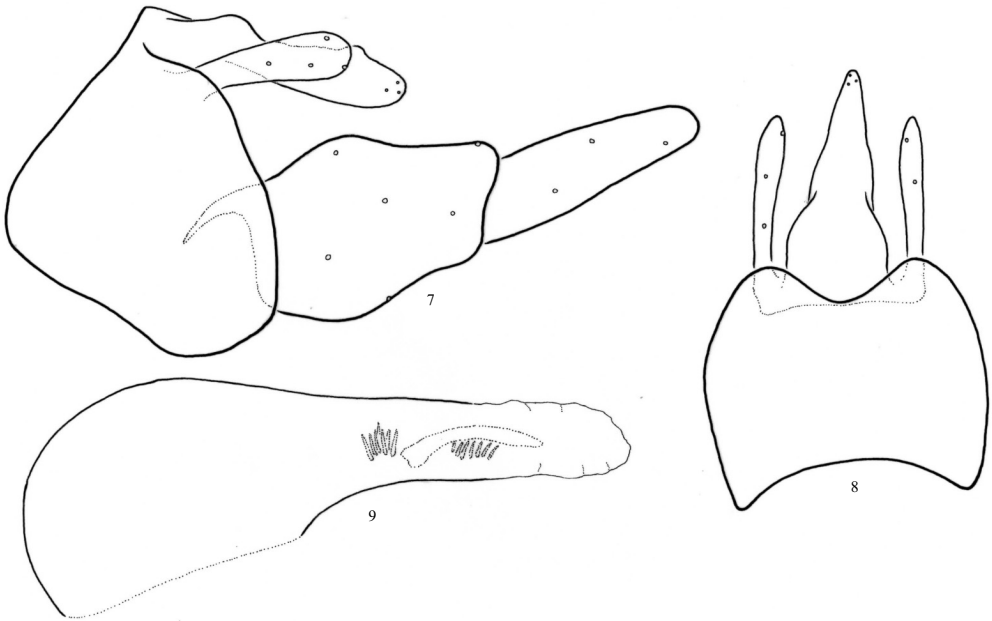
*Etymology* – *daga*, from “dagadt”, swollen in Hungarian, refers to the apical shape of the segment X in lateral view.

### ***Wormaldia graeca* Oláh sp. n. (Figs 7–9)**

*Wormaldia kimminsi* Botosaneanu, 1960 – MALICKY (1977): 68. Greece, Pendayi. Misidentification.

*Wormaldia kimminsi* Botosaneanu, 1960 – OLÁH (2010): 70. Greece, Phocis prefecture, Vargiani. Misidentification.

*Diagnosis* – Specimens from Greece have been determined and redrawn by MALICKY (1977) as *Wormaldia kimminsi* Botosaneanu, 1960, a species described from Perister Mts, Macedonia. MALICKY (1977) has re-examined and redrawn the holotype. Later his own drawings and not the original drawings of holotype were published in his Atlas of European



**Figs 7–9.** *Wormaldia graeca* Oláh sp. n. male holotype: 7 = genitalia in lateral view; 8 = segment X and cerci in dorsal view; 9 = phallic organ in left lateral view

Trichoptera (MALICKY 1983, 2004). His drawings from the holotype are identical with the original drawings of Botosaneanu as regards the lateral view of segment X and the endothecal carinated, apparently doubled spine. Segment X on his drawings from the Greece specimens is however clearly different. We have recollected specimen from Greece and specimen from Perister Mts. We found that the drawing in Malicky's Atlas under the name *W. kimminsi* is a new species described here as *W. graeca* sp. n. This new species differs from *W. kimminsi* by having completely different segment X: (1) the dorsal subapical tooth is large rounded, not just visible small and pointed; (2) the middle depression is present and significant, not absent; (3) basolateral pair of flange sclerites well developed, not lacking. Moreover as emphasized by Botosaneanu in his original description the apicomeral excision on tergite VIII is shallow trapezoid. The same excision is deep triangular in *W. graeca* sp. n. There are significant divergences between the two species also in the endothecal spine systems. The primary large spine is longer, not doubled; there are two clusters of secondary spines, not only a single.

The number, position, size, shape and clustering of endothecal spine system are commonly used to differentiate among *Wormaldia* species. However two characters, the position and clustering of spines in the endotheca of *Wormaldia* species have apparent variability. Actually there are no two specimens having the same spine or cluster position. These two characters of spine system are highly state dependent. Position and cluster fragmentation change according to the erection or inversion and eversion states of the endotheca. There are also copulatory or post-copulatory rearrangement in spine position and clustering resulted by any functional activities inside the female genital chamber. Whether the endothecal spines have stimulatory function

in cryptic female choice, harm function in sexually antagonistic coevolution, sperm removal function in sperm competition or anchor function to prolong copulation.

*Description* – Male (in alcohol). Small castaneous brown animal. Sclerites medium brown, setal warts both on head and thorax brown. Maxillary palp formula is I-II-IV-III-V. Forewing length 4 mm. Spur formula is 244.

Male genitalia. Tergit VIII with broad rounded triangular mesal excision on the apical margin. Segment X characterized by large blunt and rounded dorsal subapical tooth, by well discernible middle depression and by basolateral pair of conspicuous flange of sclerite in lateral view and by a narrowing apex in dorsal view. Gonopods with harpagones having slightly narrowing apex and longer than coxopodite. Phallic organ with eversible membranous endotheca containing a long stout spine and two clusters of smaller spines.

*Type material* – Holotype. **Greece**, Phocis county, Vargiani, springs and torrent in the village, N38°38.499', E22°25.515', 970 m, 08.04.2009, DL-KJ-MD (1♂, HNHM).

*Etymology* – *graeca* named for the country of the type locality.

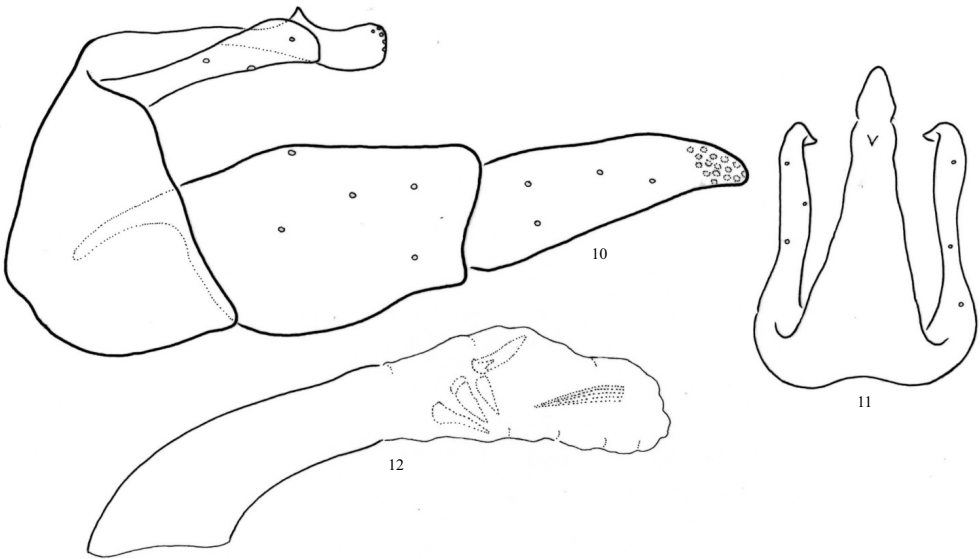
***Wormaldia homora* Oláh sp. n. (Figs 10–12)**

*Wormaldia triangulifera asterusia* Malicky, 1972 – KUMANSKI (1975): 59. Misidentification.

*Wormaldia triangulifera asterusia* Malicky, 1972 – KUMANSKI & MALICKY (1976): 103. Misidentification.

*Wormaldia triangulifera* McLachlan, 1878 – KUMANSKI (1985): 165–166. misidentification.

*Diagnosis* – The species under the name of *Wormaldia triangulifera asterusia* Malicky, 1972 were collected from several regions in Bulgaria: Stara Planina, Pirin Mts, Strandscha Mts (KUMANSKI & MALICKY 1976). Specimens from various regions exhibit rather stable genital structures: especially the head of segment X and the endothecal spine pattern are con-



**Figs 10–12.** *Wormaldia homora* Oláh sp. n. male holotype: 10 = genitalia in lateral view; 11 = segment X and cerci in dorsal view; 12 = phallic organ in left lateral view

servative. We have a single specimen from the Eastern Rodopi Mts and compared its fine structure with specimens of *W. asterusia* collected from Greece (Crete) *W. homora* sp. n. is most close to *W. asterusia*, but differs by having apex of segment X high, not low, apical portion of cerci truncate, not rounded in lateral view and the subapical mesal projection triangular, not rounded lobe in dorsal view; apices of harpago narrowing and downward curving, not broad; endothecal spine structure different.

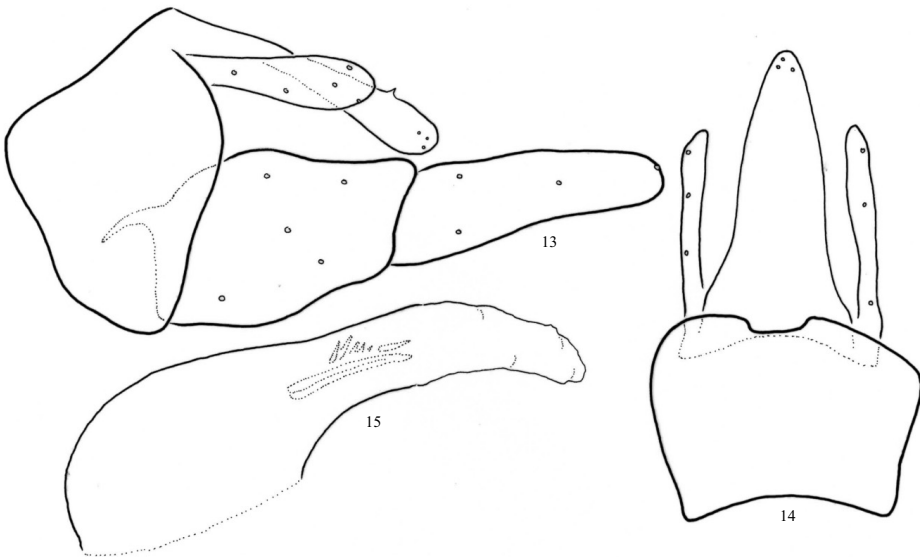
*Description* – Male (in alcohol). Small castanean brown animal. Sclerites medium brown, setal warts both on head and thorax and legs brown. Maxillary palp formula is I-II-IV-III-V. Forewing length 4 mm. Spur formula is 244.

Male genitalia. Tergit VIII with shallow mesal excision on the apical margin. Segment X characterized by elongated apex in dorsal view; apex beyond dorsal point high with concave dorsum in lateral view. Cerci with truncate apex in lateral view and with triangular mesal subapical projection in dorsal view. Gonopods, both coxopodite and harpago elongated slender; harpagones having narrowing apex and slightly curving downward. Phallic organ with eversible membranous endotheca containing four stout spines and a single composed spine formed by several closely adhered fibre-like structures.

*Type material* – Holotype. **Bulgaria**, Eastern Rodopi, near Strazhetz, above the crossroad Gugutka-Krumovgrad, N41°21'11", E25°50'35", 575 m, 24.07.2012, at light, S. Beshkov, M. Beshkova (1♂, NMNHBAS).

*Etymology* – *homora*, from “homorú”, concave in Hungarian, refers to the apical shape of the segment X in lateral view. The apical portion beyond the subapical dorsal point is concave in lateral view.

*Wormaldia kimminsi* Botosaneanu, 1960 (Figs 13–15) – **Macedonia**, Pelagonia region, Pelister Mts, Nižepole, forest brook below the ski station, N40°58.889', E21°15.246', 1370 m, 7.05.2014, KT-MD (1♂, OPC).



**Figs 13–15.** *Wormaldia kimminsi* Botosaneanu, 1960, male: 13 = genitalia in lateral view; 14 = segment X and cerci in dorsal view; 15 = phallic organ in left lateral view

*Wormaldia occipitalis* Pictet, 1834 – **Macedonia**, Southwestern region, Jablanica Mts, Vevčani, Vevčani Springs and outlet stream at the city, N41°14.371', E20°35.056', 935 m, 26.06.2014, JP-KT-MD (1♂, OPC). Southeastern region, Plavuš Hills, Valandovo, forest brook at Motel Izvor, N of the city, N41°19.636', E22°33.327', 260 m, 06.05.2014, KT-MD (1♂, 2♀, OPC).

ECNOMIDAE Ulmer, 1903

*Ecnomus tenellus* (Rambur, 1842) – **Albania**, Shkodër district, Omarë, spring fed lake and its outlet W of the village, N42°09.226', E19°27.827', 10 m, 27.06.2014, JP-KT-MD (9♀, OPC).

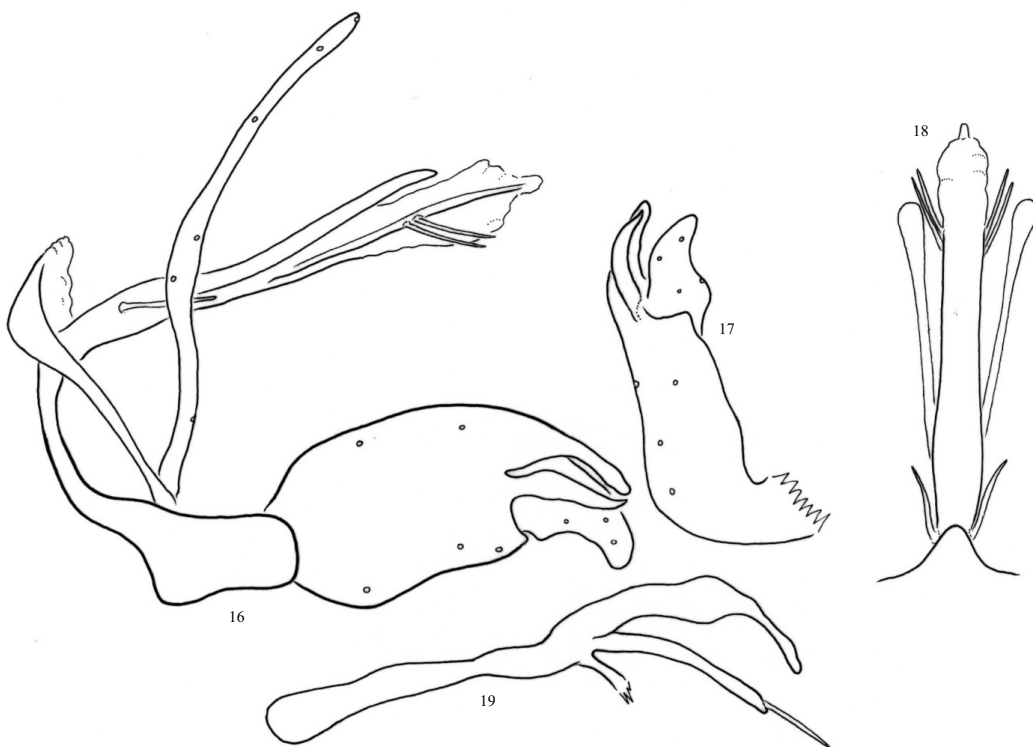
PSYCHOMYIIDAE Walker, 1852

*Lype reducta* (Hagen, 1836) – **Albania**, Shkodër district, Omarë, spring fed lake and its outlet W of the village, N42°09.226', E19°27.827', 10 m, 27.06.2014, JP-KT-MD (1♂, OPC).

*Tinodes archilochos* Malicky, 1977 – **Greece**, South Aegean, Naxos regional unit, Abram, stream and its plane tree gallery N of the village, N37°10.177', E25°29.291', 50 m, 06.04.2013, KJ-MD-SzT (1♂, HNHM).

### *Tinodes karpathos* Oláh sp. n. (Figs 16–19)

*Diagnosis* – The new species is close to *Tinodes reisseri* Malicky, 1971 described from Crete, but differs by having aedeagus, gonopod and basal plate of gonopod with differently patterned processes.



**Figs 16–19.** *Tinodes karpathos* Oláh sp. n. male holotype: 16 = genitalia in lateral view; 17 = left gonopod in ventral view; 18 = phallic organ and paraproct in dorsal view, 19 = basal plate of gonopod in lateral view



*Description* – Male (in alcohol). Small light brown animal. Sclerites medium brown, setal warts both on head and thorax lighter. Maxillary palp formula is I-IV-II-III-V. Forewing length 4 mm, forewing median cell closed. Spur formula is 244.

Male genitalia. IXth abdominal segment represented by sternite and tergite, tergite subtriangular, sternite subquadrangular in lateral view; setaless tergite is apron-shaped, its basal half more dark due to the finely granulated surface densely packed with microtrichia roofing and bracing directly over phallic apparatus and the dorsal paraproctal processes; sternite low quadrangular in lateral view joining high to fulcrum complex where met with phallic organ and dorsal paraproctal processes, cerci meet sternite IX together with tergite IX. Vestigial membranous segment X present and fused to the tergum IX represented by the membranous apical part. Cerci filiform, strongly setose. Paraproct associated with the phallic organ represented by a pair of short digitiform rods without any apical seta. Gonopods the largest genital element composed of the ovoid coxopodites with trifid apex composed of setaless bifid almost equal processes and of a setose large mesal lobe; this lobe represent the harpago. Long slender phallic apparatus composed of less pigmented aedeagus with more sclerotized ductus ejaculatorius ending in a small apical protruding process; basad with a single spine-like seta and subapicad with a pair of long lateral setae on each sides.

*Type material* – Holotype. **Greece**, South Aegean, Karpathos regional unit, esochori, spring and its outlet at Vryssiani church, N35°37.954', E27°06.600', 125 m, 12.11.2012, KJ-MD (1♂, HNHM).

*Etymology* – *karpathos* named for the island of the type locality.

*Tinodes pallidulus* McLachlan, 1878 – **Bosnia & Herzegovina**, Una-Sana Canton, Mrazovac, Svetinja Spring, N45°03.118', E16°06.324', 300 m, 26.05.2012, KT-PG (12♂, OPC).

*Tinodes petaludes* Malicky, 1975 – **Greece**, South Aegean, Rhodes regional unit, Eleousa, artificial spring lake at the village, N36°16.370', E28°01.439', 290 m, 14.11.2012, KJ-MD (1♂, HNHM). South Aegean, Rhodes regional unit, Vati, roadside spring E of the village, N36°03.225', E27°54.486', 75 m, 08.11.2012, KJ-MD (2♂, HNHM).

*Tinodes rainus* Botosaneanu, 1960 – **Albania**, Kolonjë district, Grammos Mts, Rehovë, forest brook E of the village, N40°20.111', E20°43.467', 1445 m, 07.10.2014, JP-KT-PG (3♂, 1♀, OPC).

*Tinodes reisseri* Malicky, 1970 – **Greece**, Crete, Heraklion regional unit, Krasi, spring system in the village, N35°14.010', E25°28.154', 610 m, 03.04.2013, KJ-MD-SzT (3♂, 2♀, HNHM). Crete, Heraklion regional unit, Loutraki, stream and its gorge below the village, N35°03.413', E25°24.887', 670 m, 05.04.2013, KJ-MD-SzT (1♂, HNHM). Crete, Rethymno regional unit, Axos, spring S of the village, N35°17.934', E24°50.485', 590 m, 02.04.2013, KJ-MD-SzT (1♂, HNHM). Crete, Rethymno regional unit, Nithavris, spring in the village, N35°10.292', E24°43.989', 480 m, 01.04.2013, KJ-MD-SzT (1♂, 3♀, HNHM).

*Tinodes rostocki* McLachlan, 1878 – **Macedonia**, Polog region, Šar Planina, Bozovce, open brook W of the village, N42°02.759', E20°47.776', 1545 m, 24.06.2014, JP-KT-MD (3♂, 2♀, OPC). Polog region, Šar Planina, Bozovce, forest stream W of the village, N42°02.755', E20°47.723', 1565 m, 24.06.2014, JP-KT-MD (3♂, 2♀, OPC). Polog region, Šar Planina, Brodec, Tetovska Reka (Pena) in the village, N42°03.375', E20°53.561', 980 m, 24.06.2014, JP-KT-MD (4♂, 4♀, OPC). Southwestern region, Jablanica Mts, Vevčani, Vevčani Springs and outlet stream at the city, N41°14.371', E20°35.056', 935 m, 26.06.2014, JP-KT-MD (3♂, 2♀, OPC). **Montenegro**, Kolašin municipality, Manastir Morača, karst spring and its outlet at the monastery, N42°45.942', E19°23.436', 300 m, 14.06.2012, FZ-KT-MD (2♂, 1 copula, OPC).

*Tinodes unidentatus* Klapálek, 1894 – **Macedonia**, Vardar region, Kožuf Mts, open brook in bushy alpine grassland towards Ski Kožuf, N41°11.968', E22°13.550', 1610 m, 25.06.2014, JP-KT-MD (1♂, OPC).

*Tinodes urdhva* Oláh, 2010 – **Albania**, Pukë District, rocky stream above Blinisht, N42.08290°, E19.96340°, 1010 m, 13.05.2014, BZ-PD-PG (1♂, OPC).

*Cynus trimaculatus* (Curtis, 1834) – **Serbia**, Zlatibor district, Zlatibor Mts, Crni Rzav Stream along the road No. 21, N43°39.731', E19°42.575', 1010 m, 13.06.2012, FZ-KT-MD (1♂, OPC).

*Plectrocnemia mojkovacensis* Malicky, 1982 – **Albania**, Kukes county, Tropoje district, Prokletije Mts, Valbona valley, rocky grassland and shrub, NE of Valbone, N42.45685°, E19.89925°, 930 m, 01-02.09.2013, light trap, Réka Ádám-PG-László Somay (1♂, OPC).

*Polycentropus flavomaculatus* (Pictet, 1834) – **Serbia**, Zlatibor district, Zlatibor Mts, Crni Rzav Stream along the road No. 21, N43°39.731', E19°42.575', 1010 m, 13.06.2012, FZ-KT-MD (1♂, OPC).

## HYDROPSYCHIDAE Curtis, 1835

*Cheumatopsyche lepida* (Pictet, 1834) – **Albania**, Korçë district, Opari area, Moglicë, torrent in bushy flysh vegetation E of the village, N40°42.387', E20°25.067', 500 m, 27.06.2014, JP-KT-MD (3♂, 2♀, OPC).

*Diplectrona atra* McLachlan, 1878 – **Albania**, Sarandë District, Vrinë, shore of river Lumi i Pavllës, N39.71786°, E20.02033°, 10 m, 08.05.2014, BZ-PD-PG (1♂, OPC).

*Diplectrona vairyra* Schmid, 1959 – **Serbia**, Zlatibor district, Zlatibor Mts, spring brook of Crni Rzav Stream beneath Mt. Cigota, N43°37.932', E19°46.305', 1160 m, 13.06.2012, FZ-KT-MD (1♂, 1♀, OPC).

*Hydropsyche incognita* Pitsch, 1993 – **Montenegro**, Danilovgrad municipality, Daljam, Mareza Spring beneath the village, N42°28.804', E19°10.905', 30 m, 16.06.2012, FZ-KaT-KT-MD-PV (1♂, OPC).

*Hydropsyche mostarensis* Klapálek, 1898 – **Bosnia & Herzegovina**, Republika Srpska, Foča, valley of Bistrica at village Miljevina, hand collecting from the light of petrol station, N43.510°, E18.644°, 540 m, 04.08.2014, PG-SzG (2♂, OPC). **Greece**, Epirus, Thesprotia peripheral unit, Neraida, Thyamis River NE of the village, N39°31.941', E20°26.527', 35 m, 10.05.2014, KT-MD (2♂, OPC).

*Hydropsyche peristerica* Botosaneanu & Marinković-Gospodnetić, 1968 – **Bosnia & Herzegovina**, Republika Srpska, Foča, valley of Bistrica at village Miljevina, hand collecting from the light of petrol station, N43.510°, E18.644°, 540 m, 04.08.2014, PG-SzG (1♂, OPC). **Macedonia**, Vardar region, Kožuf Mts, pond and open brook in alpine grassland towards Ski Kožuf, N41°12.565', E22°13.158', 1660 m, 25.06.2014, JP-KT-MD (18♂, 4♀, OPC). Vardar region, Kožuf Mts, open brook in bushy alpine grassland towards Ski Kožuf, N41°11.968', E22°13.550', 1610 m, 25.06.2014, JP-KT-MD (1♂, OPC).

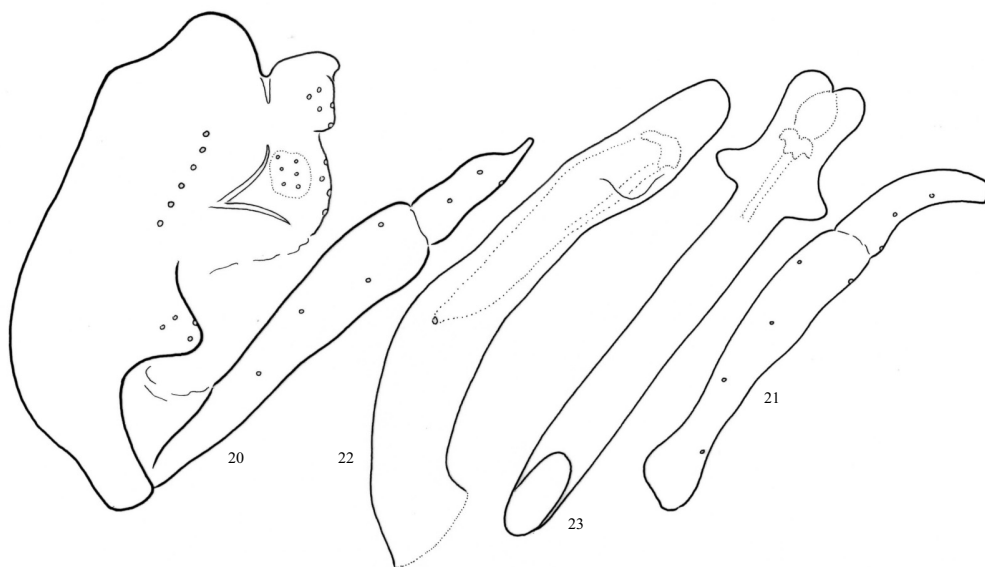
*Hydropsyche rhadamanthys* Malicky, 2001 – **Greece**, Crete, Chania regional unit, Kakopetros, stream and its plane tree gallery near the village, N35°24.803', E23°45.391', 430 m, 31.03.2013, KJ-MD-SzT (1♂, HNHM).

***Hydropsyche sarnas Oláh sp. n.* (Figs 20–23)**

*Diagnosis* – Belongs to the *Hydropsyche angustipennis* species group and to the *H. pellucidula* species cluster of OLÁH & JOHANSON (2008). Close to *H. dinarica* Marinković-Gospodnetić, 1979 but differs by the lateral profile of the median keel of segment X, by the clearly twopartite apical profile of segment X and by the extremely enlarged subapical lateral projection on the head of the phallic organ.

*Description* – Male (in alcohol). Body brown, dorsal thoracic sclerites darker. Wings ochraceous with lighter pubescence, without pronounced pattern. Maxillary palp formula I-III-IV-II-V. Spur formula 244. Forewing length 12 mm.

Male genitalia. Segment IX fused annular and short; its median keel narrowing apicad with granulose dorsal surface, this narrow keel representing the entire dorsum of segment IX shifted posteriad; apical lobe on posterolateral margin rounded triangular. Intersegmental profile between the ninth and tenth segments deep, acutely angled. Segment X short, twopartite in lateral and rounded quadrangular in dorsal view; lateral setose area, the cerci circular and located in middle position; very short and rounded ventroapical and dorsoapical setose lobes forming the apicomarginal profile of segment X in lateral view. The coxopodit of the gonopod as long as the apex of segment X, harpago with narrow apex in lateral view. Phallic organ with very produced subapical lateral rounded triangular projection.



**Figs 20–23.** *Hydropsyche sarnas* Oláh sp. n. male holotype: 20 = genitalia in lateral view; 21 = left gonopod in ventral view; 22 = phallic organ in lateral view, 23 = phallic organ in ventral view

*Type material* – Holotype. **Albania**, Gjirokaštër District, N of Humelicë, shore vegetation of river Drino, N40.17854°, E20.07981°, 170 m, 10.05.2014, BZ-PD-PG (1♂, OPC).

*Etymology* – *sarnas*, from “szárnyas”, winged in Hungarian, refers to the very much produced, wing-like angular, subapical, lateral projections before the cleft apex of the phallosome.

*Hydropsyche tabacarii* Botosaneanu, 1960 – **Macedonia**, Polog region, Šar Planina, Bozovce, forest stream W of the village, N42°02.755', E20°47.723', 1565 m, 24.06.2014, JP-KT-MD (2♂, OPC).

#### RHYACOPHILIDAE Stephens, 1836

*Rhyacophila balcanica* Radovanović, 1953 – **Albania**, Bulqizë district, Çermenikë Mts, Ballenjë, open stream, N41°21.621', E20°14.472', 1365 m, 20.06.2012, UV light, FZ-KT-MD (2♂, 1♀, OPC). **Macedonia**, Polog region, Šar Planina, Bozovce, open stream, brooks and seeps W of the village, N42°03.147', E20°46.920', 1880 m, 24.06.2014, JP-KT-MD (2♂, OPC). **Montenegro**, Kolasin municipality, Monastir Moraca, karst spring and its outlet at monastery, N42°45.942', E19°23.436', 300 m, 19.08.2011, UV light, Sz. Czigány, D. Murányi (1♂, OPC).

*Rhyacophila bosnica* Schmid, 1970 – **Bosnia & Herzegovina**, Banja Luka region, Kozara Mts, Kozarac, forest stream above the city, N44°59.920', E16°52.868', 410 m, 16.03.2012, KT-MD-PG (2♂, OPC).

*Rhyacophila fischeri* Botosaneanu, 1957 – **Greece**, Thrace, Rhodope peripheral unit, Sapka Mts, Nea Sanda, forest brook and oak forest E of the village, N41°07.672', E25°53.223', 650 m, 26.05.2012, KJ-MD-SzT (1♂, OPC). Thrace, Rhodope peripheral unit, Sapka Mts, Nea Sanda, open brook and pasture NE of the village, N41°07.965', E25°54.052', 790 m, 26.05.2012, KJ-MD-SzT (3♂, OPC).

*Rhyacophila loxias* Schmid, 1970 – **Bosnia & Herzegovina**, Republika Srpska, Foča, Sutjeska NP, Zelengora Mts, S of village Todevac, stream Hrčavka, N43.351', E18.638°, 960 m, 08.08.2014, at light 20:45–22:15, PG-SzG (1♂, OPC).

*Rhyacophila mocsaryi* Klapálek, 1898 – **Macedonia**, Polog region, Šar Planina, Brodec, Tetovska Reka (Pena) in the village, N42°03.375', E20°53.561', 980 m, 24.06.2014, JP-KT-MD (2♂, OPC).

*Rhyacophila obtusa* Klapalek, 1894 – **Bulgaria**, Blagoevgrad province, Belasica Mts, Petrič, spring of Lesniska Stream SW of the city, N41°21.021', E23°10.767', 1025 m, 05.05.2014, KT-MD (15♂, 7♀, OPC). Kardzhali Province, Zálti Djal Mts, Sedlarci, spring and limestone gorge NW of the village, N41°33.073', E25°01.783', 585 m, 30.05.2012, KJ-MD-SzT (1♂, 2♀, OPC).

*Rhyacophila torrentium* Pictet, 1834 – **Bosnia & Herzegovina**, Republika Srpska, Foča, Sutjeska NP, Zelengora Mts, S of village Tođevac, stream Hrčavka, N43.351°, E18.638°, 960 m, 08.08.2014, at light 20:45–22:15, PG-SzG (2♂, 3♀, OPC).

*Rhyacophila trescavicensis* Botosaneanu, 1960 – **Macedonia**, Southwestern region, Jablanica Mts, Labuništa, open brook W of the city, N41°16.069', E20°31.242', 1905 m, 26.06.2014, JP-KT-MD (5♂, 15♀, OPC). Southwestern region, Jablanica Mts, Vevčani, Vevčani Springs and outlet stream at the city, N41°14.371', E20°35.056', 935 m, 07.05.2014, KT-MD (1♂, 1♀, OPC); 26.06.2014, JP-KT-MD (2♂, OPC).

*Rhyacophila tristis* Pictet, 1834 – **Bulgaria**, Smoljan Province, Ardinski Djal Mts, Kopritata, stream and mixed forest SW of the village, N41°24.089', E24°46.786', 995 m, 30.05.2012, KJ-MD-SzT (2♂, OPC). **Macedonia**, Polog region, Šar Planina, Bozovce, forest stream W of the village, N42°02.755', E20°47.723', 1565 m, 24.06.2014, JP-KT-MD (1♀, OPC). Polog region, Šar Planina, Bozovce, open brook W of the village, N42°02.759', E20°47.776', 1545 m, 24.06.2014, JP-KT-MD (3♂, 2♀, OPC). **Montenegro**, Mojkovac municipality, Sinjajevina Mts, Gornja Polja, Zoljski Ljevak Stream above the village, N42°57.808', E19°31.597', 880 m, 14.06.2012, FZ-KT-MD (3♂, OPC).

*Rhyacophila tsurakiana* Malicky, 1984 – **Albania**, Sarandë District, Vrinë, shore of river Lumi i Pavllës, N39.71786°, E20.02033°, 10 m, 08.05.2014, BZ-PD-PG (2♂, OPC).

*Rhyacophila vranitzensis* Marinković-Gospodnetić & Botosaneanu, 1967 – **Montenegro**, Mojkovac municipality, Sinjajevina Mts, Gornja Polja, Zoljski Ljevak Stream above the village, N42°57.808', E19°31.597', 880 m, 14.06.2012, FZ-KT-MD (1♂, OPC).

#### GLOSSOSOMATIDAE Wallengren, 1891

*Agapetus iridipennis* (McLachlan, 1879) – **Albania**, Tropojë district, Palc, forest stream on the right bank of Koman Lake, N42°15.496', E19°54.599', 215 m, 18.06.2012, FZ-KT-MD (1♂, 2♀, OPC). **Macedonia**, Polog region, Šar Planina, Bozovce, open brook W of the village, N42°02.759', E20°47.776', 1545 m, 24.06.2014, JP-KT-MD (1♂, OPC).

#### HYDROPTILIDAE Stephens, 1836

*Hydroptila aegyptia* Ulmer, 1963 – **Albania**, Shkodër district, Omarë, spring fed lake and its outlet W of the village, N42°09.226', E19°27.827', 10 m, 27.06.2014, JP-KT-MD (2♂, 1♀, OPC).

*Hydroptila sparsa* Curtis, 1834 – **Albania**, Shkodër district, Omarë, spring fed lake and its outlet W of the village, N42°09.226', E19°27.827', 10 m, 27.06.2014, JP-KT-MD (2♂, 1♀, OPC).

#### PHRYGANEIDAE Leach, 1815

*Phryganea ochrida* Malicky, 1975 – **Albania**, Pogradec District, hillside and shore of Ohrid lake 1.5 km S of Lin, N41.051°, E20.643°, 700 m, 21-22.06.2014, PG (1♀, OPC).

#### BRACHICENTRIDAE Ulmer, 1903

*Micrasema minimum* (McLachlan, 1876) – **Macedonia**, Polog region, Šar Planina, Bozovce, forest stream W of the village, N42°02.755', E20°47.723', 1565 m, 24.06.2014, JP-KT-MD (8♂, 4♀, OPC). **Montenegro**, Kolašin municipality, Manastir Morača, karst spring and its outlet at the monastery, N42°45.942', E19°23.436', 300 m, 14.06.2012, FZ-KT-MD (1♂, OPC).

*Micrasema sericeum* Klapalek, 1902 – **Albania**, Tiranë district, Gropë Mts, Bizë, Kaprol Stream and its sidebrook at the military camp, N41°20.354', E20°11.932', 1250 m, 20.06.2012, FZ-KT-MD (2♂, OPC). **Montenegro**, Kolašin municipality, Manastir Morača, karst spring and its outlet at the monastery, N42°45.942', E19°23.436', 300 m, 14.06.2012, FZ-KT-MD (4♂, OPC).

#### UENOIDAE Iwata, 1927

*Thremma anomalum* McLachlan, 1876 – **Macedonia**, Polog region, Šar Planina, Bozovce, open brook W of the village, N42°02.759', E20°47.776', 1545 m, 24.06.2014, JP-KT-MD (1♂, OPC).

*Goera pilosa* (Fabricius, 1775) – **Greece**, West Macedonia, Kozani peripheral unit, Neapoli, Aliakmonas River NE of the city, N40°19.976', E21°24.678', 555 m, 08.05.2014, KT-MD (11♂, 14♀, OPC). **Serbia**, Zlatibor district, Zlatibor Mts, Crni Rzav Stream along the road No. 21, N43°39.731', E19°42.575', 1010 m, 13.06.2012, FZ-KT-MD (2♂, OPC).

*Silo graellsei* Pictet, 1865 – **Bosnia & Herzegovina**, Una-Sana Canton, Mrazovac, Svetinja Spring, N45°03.118', E16°06.324', 300 m, 26.05.2012, KT-PG (2♂, OPC).

*Silo pallipes* (Fabricius, 1781) – **Montenegro**, Kolašin municipality, Manastir Morača, karst spring and its outlet at the monastery, N42°45.942', E19°23.436', 300 m, 14.06.2012, FZ-KT-MD (4♂, 6♀, OPC).

*Silo piceus* (Brauer, 1857) – **Albania**, Korçë district, Opari area, Pulahë, Osojë Stream above its confluence to Çemicë River, N40°39.814', E20°28.518', 590 m, 12.05.2014, KT-MD (1♂, OPC).

*Note* – Unique genital modification developed in this single specimen. The mesal dorsal process on segment X doubled and moved laterad near to the basement of cerci. Another modification developed on the lateral lobes of segment X, the parallel-sided lateral margin of the lobes produced a broader basal and a narrower apical half. More specimens are required to understand the nature of this modification, whether atavistic, random or specification processes have produced this structural alterations.

## LIMNEPHILIDAE Kolenati, 1848

*Drusus biguttatus* (Pictet, 1834) – **Montenegro**, Kolašin municipality, Manastir Morača, karst spring and its outlet at the monastery, N42°45.942', E19°23.436', 300 m, 14.06.2012, FZ-KT-MD (2♂, OPC).

*Drusus discophoroides* Kumanski, 1979 – **Bulgaria**, Blagoevgrad province, Belasica Mts, Petrič, spring of Lesniska Stream SW of the city, N41°21.021', E23°10.767', 1025 m, 05.05.2014, KT-MD (20♂, 7♀, OPC).

*Drusus discophorus* Radovanović, 1942 – **Macedonia**, Southwestern region, Jablanica Mts, Labuništa, open brook W of the city, N41°16.069', E20°31.242', 1905 m, 26.06.2014, JP-KT-MD (7♂, 1♀, OPC).

*Drusus graecus* McLachlan, 1876 – **Greece**, Thessaly, Trikala peripheral unit, Lakmos Mts, Chaliki, open brook W of the village, N39°40.895', E21°08.261', 1840 m, 09.05.2014, KT-MD (1♂, 1♀, OPC). Thessaly, Trikala peripheral unit, Lakmos Mts, Chaliki, open stream SW of the village, N39°40.267', E21°09.176', 1430 m, 09.05.2014, KT-MD (1♂, 2♀, OPC). Thessaly, Trikala peripheral unit, Lakmos Mts, Chaliki, springs on Verliga Plateau, N39°40.825', E21°07.551', 2020 m, 09.05.2014, KT-MD (3♂, 2♀, OPC).

*Drusus krusniki* Malicky, 1981 – **Albania**, Shkodër district, Prokletije Mts, Mollë, Maljag Stream on the right bank of Koman Lake, N42°11.673', E19°49.063', 185 m, 18.06.2012, FZ-KT-MD (1♂, OPC). **Montenegro**, Žabljak municipality, Sinjajevina Mts, Dobrolovina, forest stream at the monastery, N43°01.652', E19°24.086', 765 m, 14.06.2012 FZ-KT-MD (1♂, OPC).

*Drusus plicatus* Radovanović, 1942 – **Macedonia**, Southwestern region, Jablanica Mts, Vevčani, Vevčani Springs and outlet stream at the city, N41°14.371', E20°35.056', 935 m, 07.05.2014, KT-MD (8♂, 14♀, OPC); 26.06.2014, JP-KT-MD (2♂, 2♀, OPC); 10.10.2014, JP-KT-PG (13♂, 58♀, OPC).

*Drusus septentrionis* Marinković-Gospodnetić, 1976 – **Bosnia & Herzegovina**, Canton 10, Livno, Duman Spring, cave, limestone rocks and dry grassland in the Old Town, N43°49.893', E17°00.504', 755 m, 04.10.2007, DL-KJ-MD (2♂, OPC).

*Drusus siveci* Malicky, 1981 – **Bosnia & Herzegovina**, Republika Srpska, Foča, Sutjeska NP, Zelengora Mts, S of village Govza, brooks and outlets of Bijelo jezero, N43.380°, E18.584°, 1420 m, 08.08.2014, netting, PG-SzG (5♂, OPC).

*Drusus tenellus* (Klapálek, 1898) – **Macedonia**, Southwestern region, Ohrid Lake Basin, Šum (Shum), Šum Spring Lake in the village, N41°10.974', E20°37.938', 705 m, 07.05.2014, KT-MD (1♂, OPC).

*Ecclisopteryx dalecarlica* Kolenati, 1848 – **Montenegro**, Mojkovac municipality, Sinjajevina Mts, Gornja Polja, Zoljski Ljevak Stream above the village, N42°57.808', E19°31.597', 880 m, 14.06.2012, FZ-KT-MD (1♂, OPC).

*Ecclisopteryx keroveci* Previšić, Graf & Vitecek, 2014 – **Macedonia**, Polog region, Šar Planina, Brodec, Tetovska Reka (Pena) in the village, N42°03.375', E20°53.561', 980 m, 24.06.2014, JP-KT-MD (1♂, 1♀, OPC). Southwestern region, Jablanica Mts, Vevčani, Vevčani Springs and outlet stream at the city, N41°14.371', E20°35.056', 935 m, 26.06.2014, JP-KT-MD (2♂, 1♀, OPC).

*Anabolia furcata* Brauer, 1857 – **Croatia**, Papuk Mts, Slatinski Drenovac, Jankovac, Jankovac spring, 45°31'08.1", 17°41'11.9", 510 m, 06.11.2012, KT-MG (1♀, OPC).

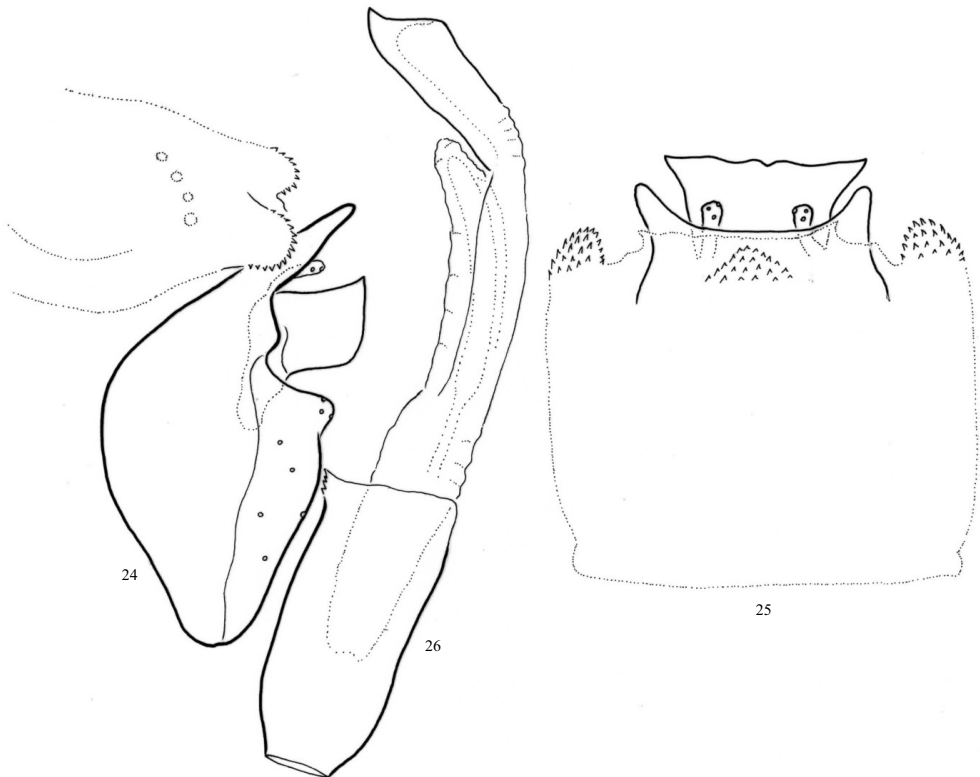
*Limnephilus affinis* Curtis, 1834 – **Macedonia**, Polog region, Šar Planina, Bozovce, open stream, brooks and seeps W of the village, N42°03.147', E20°46.920', 1880 m, 24.06.2014, JP-KT-MD (2♂, OPC).

*Linnephilus graecus* Schmid, 1965 – Montenegro, Danilovgrad municipality, Daljam, Mareza Channel beneath the village, N42°28.461', E19°10.799', 30 m, 16.06.2012, FZ-KaT-KT-MD-PV (1♂, OPC).

*Linnephilus sparsus* Curtis, 1834 – Albania, Mat district, Gropë Mts, forest brook along the Klos-Elbasan road, N of Shtyllë Pass, N41°22.455', E20°05.073', 1505 m, 20.06.2012, FZ-KT-MD (2♂, 3♀, OPC). Macedonia, Polog region, Šar Planina, Bozovce, open stream, brooks and seeps W of the village, N42°03.147', E20°46.920', 1880 m, 24.06.2014, JP-KT-MD (4♂, 7♀, OPC).

***Annitella jablanicensis* Oláh sp. n. (Figs 24–32)**

**Diagnosis** – The new species collected on high elevation of the Jablanica Mts in Macedonia is a sister species to *Annitella triloba* Marinković-Gospodnetić, 1955 and *A. ostrovicensis* Oláh & Kovács, 2012. It differs in male by having tergite VIII with reduced, mintituarized median spinate lobe, not without any such lobe like *A. ostrovicensis* and not with large spinate lobe dominating over the dorsum of tergite VIII like *A. triloba*; needle-pointed paraproct without median process, with well developed median process in all the 29 population in Albania Bulgaria, Montenegro; cerci present, vestigial at *A. ostrovicensis*. Also differs in female by having sternite IX (setosa lateral lobes) and dorsal black region of segment X differently formed. Probably an “island” allopatric species occurs not far from the southernmost populations of its sister species *A. triloba*. However a detailed fine structure analysis of

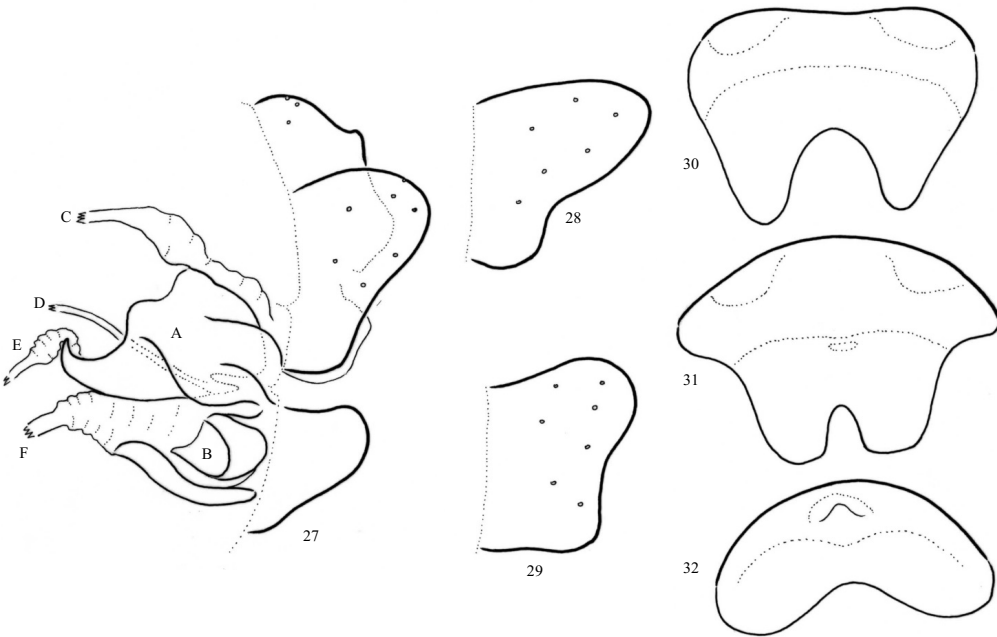


**Figs 24–26.** *Annitella jablanicensis* Oláh sp. n. male holotype: 24 = genitalia in lateral view; 25 = tergite VIII, dorsal processes of tergum IX, cerci and paraproct in dorsal view; 26 = phallic organ in lateral view

several populations of all the three sibling species will give us more details about the early stages of their speciation. A comparative analysis of the phallic and peripheral organs of cerci, paraproct as well as the vaginal sclerite complex, the female sternite IX and the black region of segment X is recommended. We have examined and recorded very high stability of the paraproct fine structure of *A. triloba* in the 9 Albanian, 8 Bulgarian and 12 Montenegrin populations.

*Description* – Male (in alcohol). Dark brown animal with lighter body appendages and with pale yellowish testaceous wings. Maxillary palp formula I-II-III. Head dorsum, mesothorax and metathorax, femurs and setal warts dark brown, face, prothorax and legs yellowish brown. Anterior wing with rounded apex and with long erect spine-like setae present on both the membrane and the veins. Tibial spur number reduced to 022. Femur and tibia armed on foreleg with long mesal row of dense short spines. Forewing length 12 mm.

Male genitalia (Figs 24–26) Posterodorsal spinate lobe of vestitural noncellular microtrichiae on segment VIII small, lateral spinate lobes present. Segment IX short, dorsum developed into a pair of lateral tapering lobes. Digitiform cerci present. Paraproctal complex (intermediate appendages) composed of a pair of heavily sclerotized mesally concave quadratic plate with needle pointed dorsoapical corner, most visible in lateral view.



**Figs 27–32.** *Annitella jablanicensis* Oláh sp. n. female allotype: 27 = genitalia with the vaginal sclerite complex in lateral view: A = dorsal vaginal sclerite complex, B = ventral vaginal sclerite complex articulating to the gonopods of segment IX, C = inlet duct of accessory glands, D = ductus spermathecae, E = ductus bursae, F = common oviduct; 28 = sternite IX of *A. ostrovicensis* Oláh & Kovács, 2012 in lateral view; 29 = sternite IX of *A. triloba* Marinković-Gospodnetić, 1955 in lateral view; 30 = shape of black pigmented area on tergite X of *A. triloba* Marinković-Gospodnetić, 1955 in caudal view; 31 = shape of black pigmented area on tergite X of *A. jablanicensis* Oláh sp. n. in caudal view; 32 = shape of black pigmented area on tergite X of *A. ostrovicensis* Oláh & Kovács, 2012 in caudal view

Membranous subanal lobe rounded. Gonopods with blunt apex. Phallic organ without distinct parameres, bifid distal sclerite well developed.

Female (in alcohol). Colour pattern is similar to the male. Maxillary palp formula I-IV-III-II-V. Spur number 122. Foreleg femur and tibia without spine row. Length of forewing 12 mm.

Female genitalia (Figs 27–32). Tergite IX short fused to segment X, scattered with vestigial small setae; a pair of lightly sclerotized membranous rounded window present dorso-laterad near anterior margin. Sternite IX subtriangular setose lobes dominating over the terminalia connected by glabrous large convex mesal plate, this glabrous ventral surface of sternite IX, supragenital plate functions like the upper vaginal lip. Segment X rounded convex, dorsal half heavily sclerotized black, bilobed in caudal view, ventral part membranous housing the anal opening. The lower vaginal lip, the trifid vulvar scale is visible somewhat separated from sternite VIII by its more sclerotized structure, glabrous without any setae; its lateral lobes mesad turning, its mesal lobe small. Vaginal chamber is short, reaching only half length of sternite VIII, beside the usual dorsal vaginal sclerite complex there is a ventral vaginal heavily sclerotized mesal sclerite attached to the gonopod of segment IX and accompanied dorsad by an apparently suspended rounded sclerotized sclerite.

*Type material* – Holotype. **Macedonia**, Southwestern region, Jablanica Mts, 6.5 km W of Labuništa, open brook at Labuniško Lake, N41°16.069', E20°31.242', 1905 m, 10.10.2014, JP-KT-PG (1♂, OPC). Allotype. Same as holotype (1♀, OPC).

*Etymology* – The new species is named after the Jablanica Mts, where the type locality is found.

*Note* – The isolated mountain range of Jablanica Mts is an endemic hotspot. All the representatives of caddisfly groups exhibiting Pleistocene divergence evolved to an incipient species in spring or lake inflow and outflow habitats of high elevation of Jablanica mountain: *Allogamus zugor* sp. n., *Annitella jablanicensis* sp. n., *Drusus discophorus* Radovanović, 1942, *Potamophylax alsos* sp. n. Other insect groups have also evolved endemic species in this mountain range: a short-winged herbivorous bushcricket *Poecilimon jablanicensis* Chobanov & Heller, 2010; a stonefly, *Isoperla vevcianensis* Ikononov, 1980 (MURÁNYI 2011); a high-altitude ground beetle *Trechus (Trechus) nezlobinskyi* Hristovski, 2014 (HRISTOVSKI 2014).

*Annitella triloba* Marinković-Gospodnetić, 1955 – **Albania**, Dibër district, Korab Mts, 3.5 km SE of Radomirë, spring area of right tributary of Elbini Stream, N41°48'10.9", E20°31'27.4", 1830 m, 11.10.2014, Juhász, KT-PG (1♂, OPC).

*Chaetopterygopsis siveci* Malicky, 1988 – **Albania**, Kolonjë district, Grammos Mts, Rehovë, swampy springs and open brooks, N40°19.907', E20°44.586', 1940 m, 08.10.2014, JP-KT-PG (32♂, 7♀, OPC). **Macedonia**, Southwestern region, Jablanica Mts, 6.5 km W of Labuništa, open brook at Labuniško Lake, N41°16.069', E20°31.242', 1905 m, 10.10.2014, JP-KT-PG (36♂, 11♀, OPC).

*Chaetopteryx stankovići* Marinković-Gospodnetić, 1966 – **Albania**, Kolonjë district, Grammos Mts, Rehovë, forest brook E of the village, N40°20.111', E20°43.467', 1445 m, 07.10.2014, JP-KT-PG (2♂, 1♀, OPC). Kolonjë district, Grammos Mts, Rehovë, swampy springs and open brooks, N40°19.907', E20°44.586', 1940 m, 08.10.2014, JP-KT-PG (1♂, OPC). Korçë district, 2.5 km W Mazrekë, E slope of Mt Mjetë, open stream, N40°36'6.8", E20°23'25.0", 1580 m, 09.10.2014, JP-KT-PG (5♂, 3♀, OPC).

*Psilopteryx montanus* Kumanski, 1968 – **Albania**, Dibër district, Korab Mts, 3.5 km SE of Radomirë, spring area of right tributary of Elbini Stream, N41°48'10.9", E20°31'27.4", 1830 m, 11.10.2014, JP-KT-PG (4♂, 1♀, OPC).

*Allogamus auricollis* (Pictet, 1834) – **Albania**, Dibër district, Korab Mts, 1 km E of Radomirë, Elbini Stream, N41.8168°, E20.5019°, 1460 m, 11.10.2014, JP-KT-PG (4♂, 5♀, OPC). Dibër district, Korab Mts, 3.5 km SE of



Radomirë, spring area of right tributary of Elbini Stream, N41°48'10.9", E20°31'27.4", 1830 m, 11.10.2014, JP-KT-PG (4♂, 3♀, OPC).

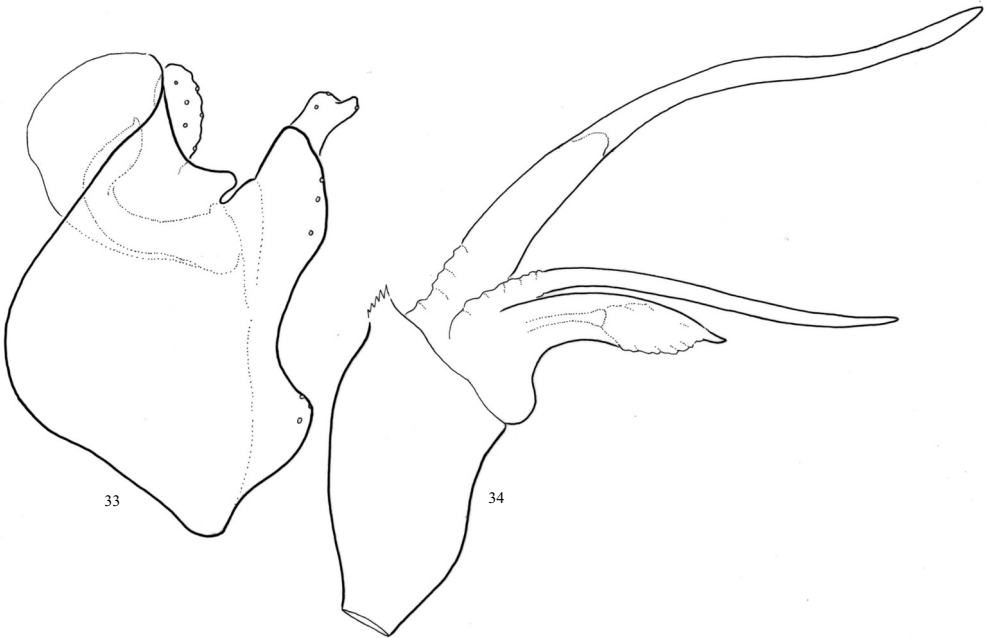
*Allogamus uncatus* (Brauer, 1857) – **Albania**, Dibër district, Korab Mts, 3.5 km SE of Radomirë, spring area of right tributary of Elbini Stream, N41°48'10.9", E20°31'27.4", 1830 m, 11.10.2014, JP-KT-PG (10♂, 12♀, OPC). Dibër district, Korab Mts, 4.5 km SE of Radomirë, open brook, N41°47'44.2", E20°31'51.7", 2050 m, 11.10.2014, JP-KT-PG (3♂, 1♀, OPC). **Slovenia**, Pohorje Mts, below Pesek, spring area of river Oplotnica, 1345 m, 46°28'24.8", 15°20'55.9", 08.11.2012, KT-MG (1♀, OPC).

### *Allogamus zugor* Oláh sp. n. (Figs 33–35)

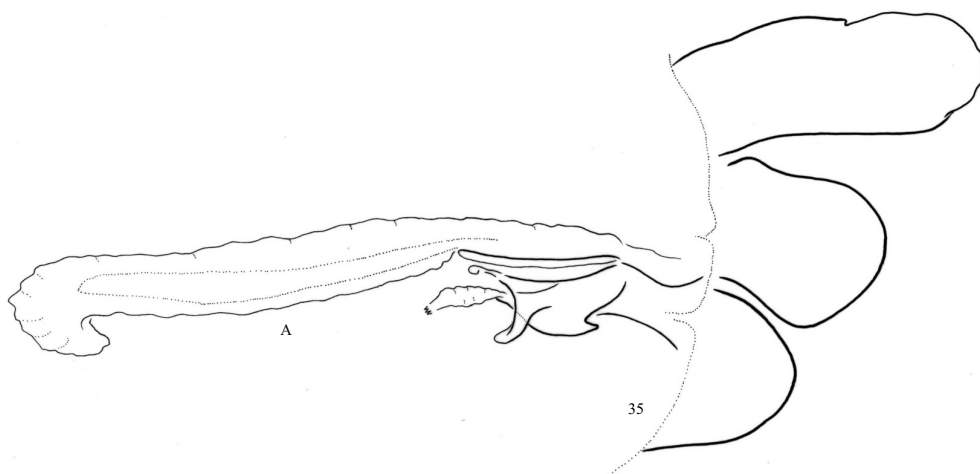
*Diagnosis* – Having three-armed aedeagus and fused paramere this new species is a member of the *uncatus* group and having mesad angled gonopods is close to *Allogamus uncatus*, it is a sister species of *A. uncatus*, and *A. tomor*. It differs from both sisters by having “apparent harpago” with monolobed apical margin turned back from transversal to sagittal plane; aedeagus minutuarized shrunk, not long slender like at *A. uncatus* or broad dilated like at *A. tomor*; parallel with shrunk aedeagus, the vagina is very small, similarly abbreviated in sexual coevolution processes.

*Description* – Male and female (in alcohol). Brown animal with spotted forewing; both male and female have a few long erect setae scattered along longitudinal veins on forewing, setae on the longitudinal veins are almost as strong as in the Chaetopterygini tribe. Forewing length of holotype male is 18 mm, and that of the allotype female is 15 mm.

Male genitalia (Figs 33–34). Posterodorsal spinate area of vestitural noncellular microtrichiae on segment VIII present. Segment IX with narrowing dorsum in lateral view; anterior margin rounded triangular with long antecosta; posterior margin fused with gonopods.



**Figs 33–34.** *Allogamus zugor* Oláh sp. n. male holotype: 33 = genitalia in lateral view; 34 = phallic organ in lateral view



**Fig. 35.** *Allogamus zugor* Oláh sp. n. female allotype: 35 = genitalia with the vaginal sclerite complex in lateral view; A = elongated modified duct of the accessory glands, receiving the fused paramere during copulation

The pouch-like concavity of segment X large giving space for the paraproct anchored female anal tube during copulation. Cerci rounded lobe with an additional more irregularly shaped mesal lobe. Apical hook of the paraproctal complex with narrowing dorsad and laterad directed pointed apex middle connecting section long, basal triangle monolobe in lateral view, basal triangles function like a supporting fulcrum during copulation. Membranous subanal lobe short. Gonopods short with mesad turning apical flap “apparent harpago” with shallowly trilobed apical margin. Phallic organ composed of short narrowing phallic apodeme, short tube of phallosome, short endotheca, aedeagus and paramere; aedeagus is short and robust arching; terminating in well-sclerotized bifid head and supplied with a pair of aedeagal rods fusing to the basement of the aedeagus; single fused paramere with bifid apical third is independently articulated to the membranous endotheca.

Female genitalia (Fig 35). Anal tube formed by the fusion of tergite IX and X is medium long slightly downward arching; setose sternite IX regular elliptical in lateral view. Supragenital plate of segment X narrow in ventral view compressed by the enlarged sternite IX. Vulvar scale (lower vulvar lip) short plate with small quadrangular excision middle with the very small mesal lobe. Vaginal chamber medium sized reaching to the middle of sternite VIII. Vaginal sclerite pattern clearly visible, elongated sheath of the modified bursa copulatrix short and wide.

*Type material* – Holotype. **Macedonia**, Southwestern region, Jablanica Mts, 6.5 km W of Labuništa, open brook at Labuniško Lake, N41°16.069', E20°31.242', 1905 m, 10.10.2014, JP-KT-PG (1♂, OPC). Allotype. Same as holotype (1♀, OPC). Paratypes. Same as holotype (1♀, OPC; 1♀, MM).

*Etymology* – *zugor* from “zsugor”, shrink in Hungarian, refers to the abbreviated and highly shrunk aedeagus, which coevaluated with the abbreviated vaginal chamber.

*Conсорophylax montivagus* (McLachlan, 1867) – **Slovenia**, Pohorje Mts, below Pesek, spring area of river Oplotnica, 46°28'24.8", 15°20'55.9", 1345 m, 08.11.2012, KT-MG (1♀, OPC).

*Enoicyla costae* McLachlan, 1876 – **Albania**, Kolonjë district, Grammos Mts, Rehovë, forest brook E of the vil-  
lage, N40°20.111', E20°43.467', 1445 m, 07.10.2014, JP-KT-PG (8♂, OPC).

*Halesus tessellatus* (Rambur, 1842) – **Slovenia**, Golovec Mts, brooklet near Rakovnik distinct (Ljubljana),  
46°02'27.5", 14°31'46.1", 335 m, 08.11.2012, KT-MG (1♂, OPC).

*Hydatophylax infumatus* (McLachlan, 1865) – **Bosnia & Herzegovina**, Una-Sana Canton, Rudenice, Sana River,  
N44°30.999', E16°48.556', 260 m, 27.05.2012, KT-PG (3♂, OPC).

*Parachiona picicornis* (Pictet, 1834) – **Macedonia**, Polog region, Šar Planina, Bozovce, open stream, brooks and  
seeps W of the village, N42°03.147', E20°46.920', 1880 m, 24.06.2014, JP-KT-MD (3♀, OPC).

*Potamophylax cingulatus* (Stephens, 1837) – **Albania**, Bulqizë district, Çermenikë Mts, Ballenjë, open stream,  
N41°21.621', E20°14.472', 1365 m, 20.06.2012, UV light, FZ-KT-MD (2♂, 1♀, OPC).

*Potamophylax luctuosus* (Piller & Mitterpacher, 1783) – **Macedonia**, Southwestern region, Jablanica Mts,  
Vevčani, Vevčani Springs and outlet stream at the city, N41°14.371', E20°35.056', 935 m, 26.06.2014, JP-KT-  
MD (1♂, 4♀, OPC).

*Potamophylax nigricornis* Pictet, 1834 – **Bulgaria**, Smoljan Province, Perelik Mts, Pamporovo, open brooks and  
alpine grassland at the settlement, N41°37.540', E24°42.411', 1560 m, 31.05.2012, KJ-MD-SzT (1♂, OPC).

*Potamophylax pallidus* Klapálek, 1899 – **Albania**, Kolonjë district, Grammos Mts, Rehovë, forest brook E of the  
village, N40°20.111', E20°43.467', 1445 m, 07.10.2014, JP-KT-PG (8♂, 6♀, OPC). Korçë district, 2.5 km W  
Mazrekë, E slope of Mt Mjetë, open stream, N40°36'6.8", E20°23'25.0", 1580 m, 09.10.2014, JP-KT-PG (3♂,  
OPC). **Bosnia & Herzegovina**, Republika Srpska, Gacko, Sutjeska NP, SE of village Izgori, spring and brook on  
the W slope of Mt Volujak, 1360 m, N43.244°, E18.667°, 05.08.2014, PG-SzG (3♂, 6♀, OPC).

### *Potamophylax tagas* species cluster

*History of the species cluster* – The *Potamophylax tagas* species cluster with three new species was described in the *Potamophylax winneguthi* species group (OLÁH & KOVÁCS 2012). This cluster is characterized by apical margin of the gonopods without any significant projections; superanal genital complex of cerci and paraproct rather uniform; paramere forms stout, upward arching and slightly narrowing rod. The very tip of the paramere rod armed with a few short and stout spines.

*Potamophylax winneguthi* species group was established recently with seven species (OLÁH & KOVÁCS 2012). They differs from the typical *Potamophylax* by having long and strong erect setae on the forewings. These very characteristic erect setae are similar to the forewings of Chaetopterygini tribe. Unlike typical *Potamophylax* they are sexually dimorph. Females are lighter and smaller than males with tendency to brachyptery and with more dense, stronger and longer erect satae. Males have long forewing with less dense, slender and shorter erect setae. These characters relate *Potamophylax tagas* species group close to the Chaetopterygini tribe, especially to the *Chaetopteroides* genus (OLÁH et al. 2013b). *Potamophylax tagas* species cluster seems even closer to the Chaetopterygini tribe, because the males of one sibling species pair, *P. tagas* and *P. kesken*, evolved further to brachyptery having female-like abbreviated forewing with dense, strong and long erect setae. When described their females were not known. In the autumn of 2014 we have collected the unknown brachypterous females of both species and discovered another new species with long-winged male and short-winged female.

*Probable speciation* - Representatives of this species complex were discovered and collected along springs and spring streams in high mountain elevations of Albania and Macedonia. They have reduced migration potential due to the almost flightless brachyptery in female and partly also in males, similarly to the spring dwelling *Chaetoperyx rugulosa* species group (OLÁH et al. 2012). Their distribution is also restricted by their unique and rare

spring habitats of high mountain elevations. Reduced gene flow and highly isolated habitat simulate an allopatry of island model. Under similar environment of high mountain spring habitat they have been diverged probably by sexual selection into closely related incipient species. We have detected divergence in the fine structure of paramere and aedagus as well as in the fine structure of vaginal sclerite complex. The periphalllic organs usually diverge mostly under ongoing random neutral differentiation compared to the non-neutral selective differentiation of the intromittant structures of the phallic organ. Parameres and aedeagus diverge in this allopatry at rather similar spring habitat, under pressure of positive sexual selection. In this species complex we have found stable and consistent divergence with variability ranges also in the lateral shape of the gonopods. Our additional collections in more populations made it possible to examine trait stability and consistency of structural divergence with their range of variability by visualized diverged structure matrices. Divergence was consistent between the two sibling pairs and between the two species of the plesiomorphic *alsos* and *hajlos* pair. Divergence between the two species of the apomorphic *kesken* and *tagas* pair was very pronounced at holotypes and paratypes, but we have detected large ranges of variation in the diverged structure matrices for the sampled new populations. According to their present altitudinal distribution *P. kesken* diverged probably under lower and *P. tagas* under higher elevation and we have sampled and examined intermediate populations in secondary sympatry. Ranges of phenotypic variation may reflect incomplete lineage sorting or migration, gene flow and hybridization of secondary contact.

*Structural divergence* – The *Potamophylax tagas* species cluster composed of two sibling pairs. (1) The plesiomorphic sexually dimorphic *P. alsos* sp. n. Oláh and *P. hajlos* Oláh, 2012. (2) The more evolved apomorphic sexually secondary monomorphic *P. kesken* Oláh, 2012 and *P. tagas* Oláh & Kovács, 2012.

*Divergence between sibling pairs.* There are both male and female traits to differentiate between the plesiomorphic and apomorphic sibling pairs. Beside the male apomorphic brachyptery the sexually monomorphic sibling pair of *P. kesken* and *P. tagas* has produced another apomorphy. A ventral vaginal sclerite suspended at the anterior of the membranous vaginal chamber was evolved in this sibling pair, not detected or reported yet in any other limnephilids (Figs 89, 92, 115, 118). *Ventral vaginal sclerite:* The very sophisticated dorsal vaginal sclerite complex has skeleton and brace function to ensure firm position for the duct inlets draining or communicating the reproductive product of the accessory gland, spermatheca and bursa copulatrix into the vaginal chamber during copulatory or postcopulatory processes: colleterial or accessory duct inlet, spermathecal duct inlet and ductus bursae inlet. The three dorsal duct inlets are fixed by the dorsal vaginal sclerite complex, therefore the common oviduct usually opens freely ventrad or anteroventrad into the vaginal chamber without any skeletal support. *P. kesken* and *P. tagas* sibling pair has diverted this opening section of the common oviduct dorsad by sclerotization of the apicoventral region of the vagina. That region is the ventral vaginal sclerite. There is a third divergent trait to differentiate between the sibling pairs. The dorsally and laterally arched parameres of the plesiomorphic *P. alsos* and *P. hajlos* pair have been straightened in ventral view at *P. kesken* and *P. tagas*.

*Gonopod divergence.* We have named the species by the diverged lateral shape of the gonopods (Figs 124–127): *alsos* (produced lower apicad), *hajlos* (produced apicoventrad), *kesken* (narrow), *tagas* (wide). The plesiomorphic pair *P. alsos* and *P. hajlos* has diverged gonopods rather consistent with smaller range of variation (Figs 40–46, 61–66). The apomor-

phic pair *P. kesken* and *P. tagas* has gonopods with larger ranges of variation (Figs 75–81, 97–105), although their holotypes have gonopods very diverged in lateral view (Figs 75, 97).

*Paramere divergence.* The very tip of the parameres concentrates a gathering of short setae, visible in details only under higher resolution. The apical setal number and pattern are characteristic and rather consistent for each species (Figs 128–131), but with a range of variability waiting further study. Plesiomorphic sibling pair has 3–4, apomorphic sibling pair has 6–10 apical setae. The holotype of *P. alsos* has 3 apical setae of almost equal length; the examined 7 paratypes have 3 apical setae, but with varying length. The holotype of *P. hajlos* has 4 apical setae similarly to the examined 5 paratypes with unequal length. The holotype and examined 7 paratypes of *P. kesken* have 6 apical setae with similar size pattern. The holotype of *P. tagas* has 2 strong and long, 3 long and thin, 4 very short, altogether 9 apical setae, specimens from the examined new population have between 7–10 apical setae of various pattern.

*Divergence of aedeagus.* Apical tip divergence of the aedeagus is well visible in ventral view. Divergence is realised in the form of the lateral lobes, in the distance between the lateral lobes and in the subapical constriction. Both sibling pairs diverged on similar plan: *P. alsos* (Figs 47–48) and *P. kesken* (Figs 82–88) are the slender tipped species and the *P. hajlos* (Figs 67–72) and *P. tagas* (Figs 106–114) are the stout tipped species of the sibling pairs. There is a range of variation, but the divergence between slender tipped and stout tipped aedeagus is remarkable in both sibling pairs.

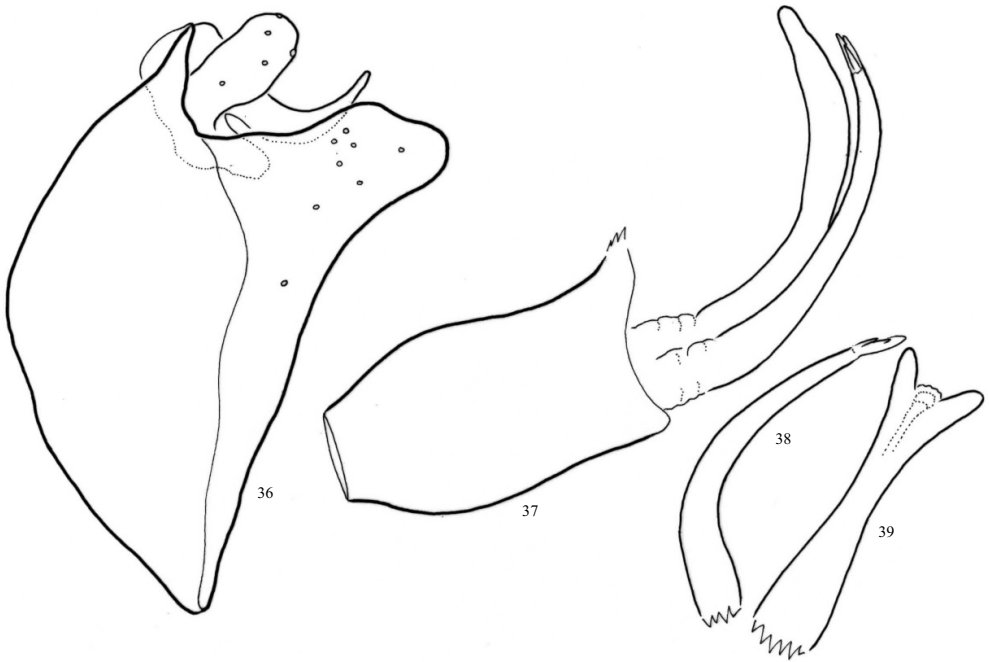
*Divergence of vaginal sclerites.* The vaginal sclerites have been diverged significantly in the *P. tagas* species cluster probably by sexual coevolution. In the *P. kesken* and *P. tagas* sibling pair an important innovation evolved in the form of a ventral vaginal sclerite separating the two sibling pairs in the cluster. The plesiomorphic pair with the ancestral state of the vaginal sclerites without ventral sclerite has produced divergence in the form of lateral margin of the dorsal sclerite complex. It is long and convex at *P. hajlos* (Fig 74), short with lateral hump at *P. alsos* (Figs 57–60). The apomorphic pair of *P. kesken* and *P. tagas* with the ventral sclerite innovation diverged by the reformation of the anterior apodemes initiated by this innovation itself. The lateral process of the anterior apodeme reduced or almost disappeared and the mesal part developed into an upward turning more sclerotized mesal lobe, anterad of the bursal sclerite. As a result the common oviduct opens into the vaginal chamber between the upward directed sclerotized mesal lobe and the ventral vaginal sclerite. The lateral process reduced to an acute-angled sclerotized process and the sclerotized mesal lobe short, less produced at *P. kesken* (Figs 92, 93–96). Lateral process less sclerotized, almost disappeared and the mesal lobe long, much produced at *P. tagas* (Figs 118, 119–123)

### ***Potamophylax alsos–P. hajlos* sibling pair**

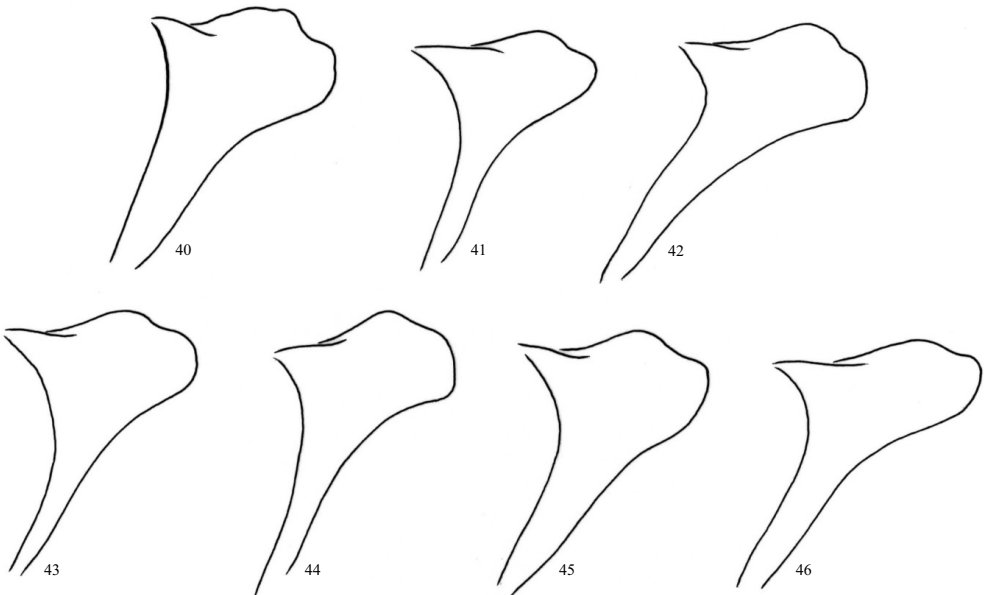
The *alsos–hajlos* sibling pair has long-forewinged males covered with less, weaker and shorter erect setae. Intromittant organ is characterized by dorsad and mesad arching parameres. The vagina has only the plesiomorphic dorsal vaginal sclerite complex and has no apomorphic sclerotized ventral vaginal sclerite.

### ***Potamophylax alsos* Oláh sp. n. (Figs 36–60, 124, 128)**

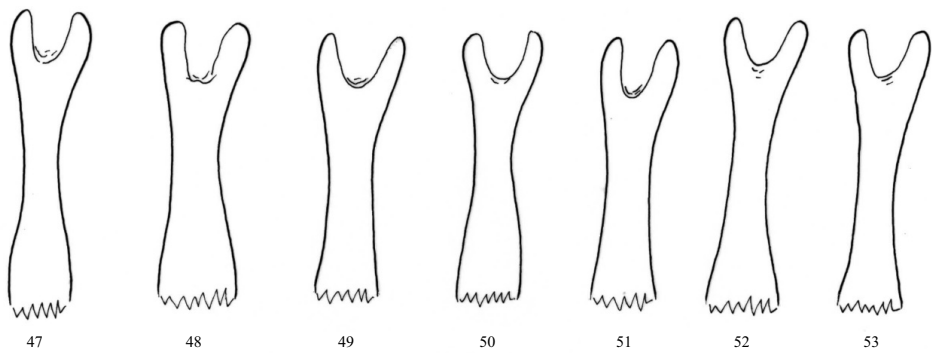
*Diagnosis* – The fourth member of the *Potamophylax tagas* species cluster. A sister or sibling species of *P. hajlos* but differs by having gonopod apical margin with backward



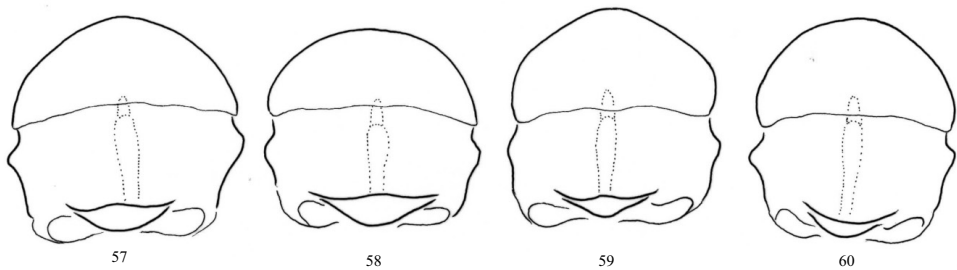
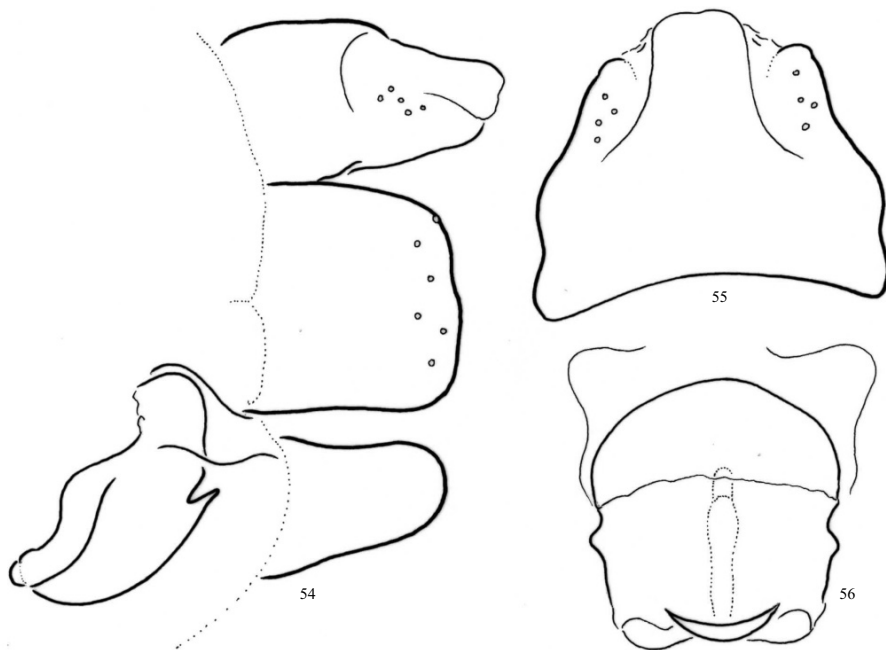
**Figs 36–39.** *Potamophylax alsos* Oláh sp. n. male holotype: 36 = genitalia in lateral view; 37 phallic organ in lateral view; = ; 38 = left paramere in ventral view; 39 = aedeagus in ventral view



**Figs 40–46.** *Potamophylax alsos* Oláh sp. n.: 40 = holotype gonopod in lateral view; 41–46 = paratype gonopods in lateral view



**Figs 47–53.** *Potamophylax alsos* Oláh sp. n.: 47 = holotype aedeagus in ventral view;  
48–53 = paratype aedeagus in ventral view



**Figs 57–60.** *Potamophylax alsos* Oláh sp. n. female paratypes: 57–60 = dorsal vaginal  
sclerite complex in dorsal view

produced lower corner, not downward directed outgrow; paramere tip with three spines; apicomasal excision on the aedeagus wide U-shaped, not narrow; lateral margin of the dorsal vaginal sclerite complex short with lateral hump, not long and convex.

*Description* – Male (in alcohol). Antennae slender. Spur number 134 both on male and female. Thoracic and femur sclerites dark brown on male, lighter on female. Forewing with very long and strong erect setae on the longitudinal veins, almost as strong as in the Chaetopterygini tribe on female, but shorter and less strong on males. Forewing length of holotype male is 15 mm, that of allotype female is 10 mm.

Male genitalia (Figs 36–53). Posterodorsal spinate area of vestitural noncellular microtrichiae on segment VIII present. Segment IX with very short dorsum and ventrum in lateral view; anterior margin rounded semicircular with long antecosta; posterior margin fused with gonopods with visible suture. The pouch-like concavity of segment X very short. Cerci elongated spatulate in lateral view. Apical hook of the paraproctal complex slender upward curving; middle connecting section broad, bipartite; basal triangle bipartite, composed of lateral small triangular and mesal narrow sclerites. Gonopods long and low with backward produced lower corner. Phallic organ composed of short narrowing phallic apodeme, short tube of phallosome, short endotheca, aedeagus and paramere; aedeagus bifid, its mesal excision wide; pair of paramere stout upward curving, its tip composed of three spines.

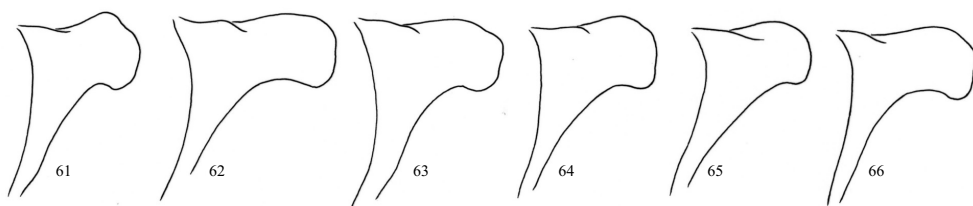
Female genitalia (Figs 54–60). Anal tube formed by the fusion of tergite IX and X is short; setose sternite IX rounded quadrangular in lateral view. Supragenital plate of segment X narrow in ventral view compressed by the enlarged sternite IX. Vulvar scale (lower vulvar lip) composed of large rounded lateral and small mesal lobe. Vaginal chamber medium sized reaching to the middle of sternite VIII. Lateral margin of dorsal vaginal sclerite complex short with a single small hump.

*Type material* – Holotype. **Macedonia**, Southwestern region, Jablanica Mts, 6.5 km W of Labuništa, open brook at Labuniško Lake, N41°16.069', E20°31.242', 1905 m, 10.10.2014, JP-KT-PG (1♂, OPC). Allotype. Same as holotype (1♀, OPC). Paratypes. Same as holotype (7♂, 3♀, OPC; 2♂, 1♀, MM).

*Etymology* – “*alsos*” from “*alsó, alsós*”, lower in Hungarian, refers to lower apical corner of the gonopods more produced compared to its dorsoapical corner. Here we follow to name this new species of the complex according to the lateral shape of the gonopod.

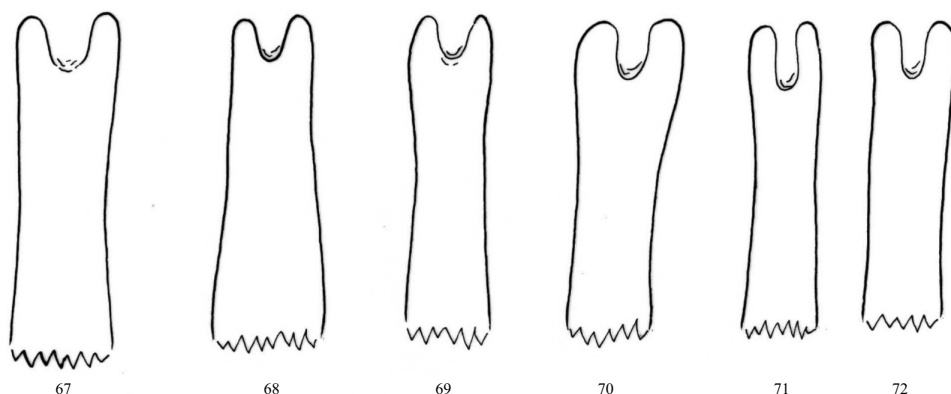
### ***Potamophylax hajlos* Oláh, 2012 (Figs 61–74, 125, 129)**

*Reexamined material*: Holotype. Albania: Tiranë district, Gropë Mts, Vakumonë, karst spring and brook along the road to Elbasan, N41°15.109', E20°05.805', 1195 m, 11.10.2012, P. Juhász, T. Kovács, D. Murányi, G. Puskás (1♂,

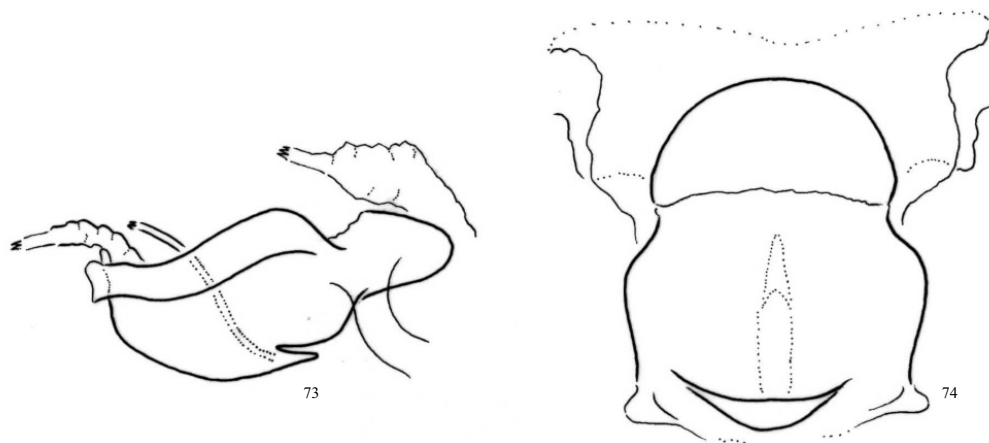


**Figs 61–66.** *Potamophylax hajlos* Oláh, 2012: 61 = holotype gonopod in lateral view; 62–63 = paratype gonopods from Gropë Mts; 64–66 = paratype gonopods from Cermenike Mts





**Figs 67–72.** *Potamophylax hajlos* Oláh, 2012: 67 = holotype aedeagus in ventral view; 68–69 = paratype aedeagus from Grope Mts; 70–72 = paratype aedeagus from Cermenike Mts



**Figs 73–74.** *Potamophylax hajlos* Oláh, 2012 female allotype: 73 = dorsal vaginal sclerite complex in lateral view; 74 = dorsal vaginal sclerite complex in dorsal view

OPC). Allotype. Same as holotype (1♀, OPC). Paratypes. Same as holotype (1♂, OPC). Bulqizë district, Çermenikë Mts, open brook beneath Mt. Kaptinë, N41°23.212', E20°17.506', 1610 m, 10.10.2012, P. Juhász, T. Kovács, D. Murányi, G. Puskás (3♂, OPC; 2♂, MM). Mat district, Gropë Mts, brook along the Klos-Elbasan road, N of Shtyllë Pass, N41°22.455', E20°05.073', 1505 m, 11.10.2012, P. Juhász, T. Kovács, D. Murányi, G. Puskás (1♂, OPC). (OLÁH & KOVÁCS 2012).

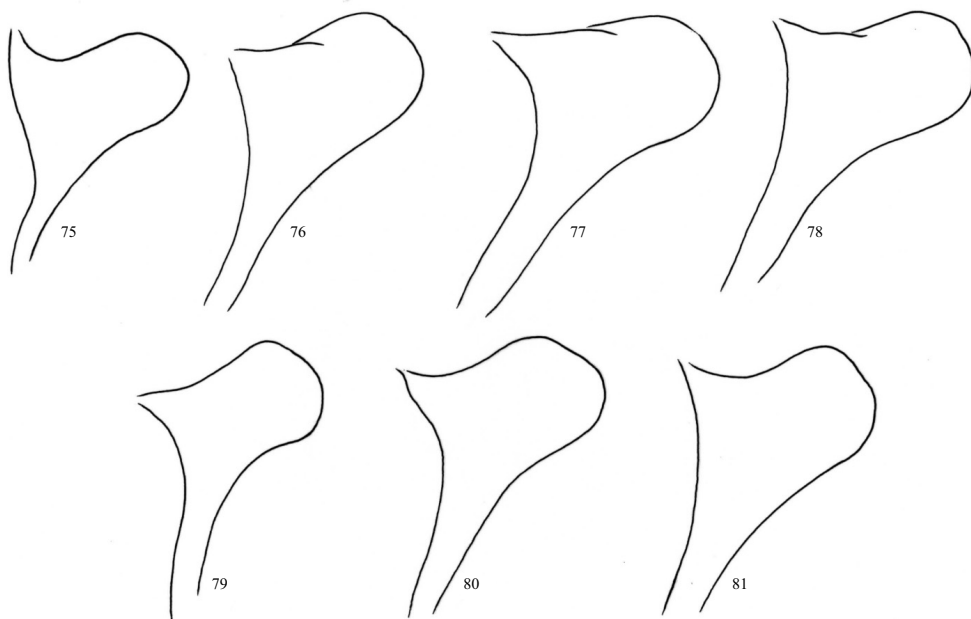
### ***Potamophylax kesken-P. tagas* sibling pair**

The males of the apomorphic *Potamophylax kesken-tagas* sibling pair has short forewing covered with dense, strong and long erect setae similarly to their females; the parameres arching only dorsad, not mesad (visible straight in ventral view). Ventral vaginal sclerite developed as a unique apomorphic structure contrasting the plesiomorphic sibling pair without innovation.

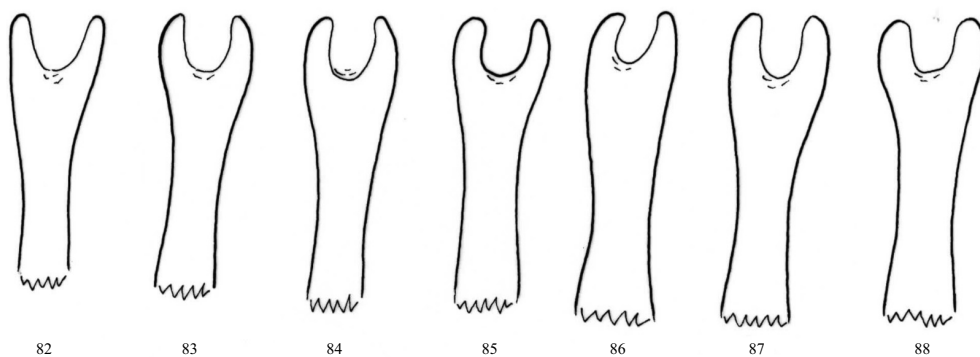
***Potamophylax kesken*** Oláh, 2012 (Figs 75–96, 126, 130)

**Albania**, Dibër district, Korab Mts, 3.5 km SE of Radomirë, spring area of right tributary of Elbini Stream, N41°48'10.9", E20°31'27.4", 1830 m, 11.10.2014, JP-KT-PG (4♂, 8♀, OPC). Dibër district, Korab Mts, 4.5 km SE of Radomirë, open brook, N41°47'44.2", E20°31'51.7", 2050 m, 11.10.2014, JP-KT-PG (7♂, 6♀, OPC; 2♂, 2♀, MM).

*Female description* (Figs 89–96) – This species was described from a single male. In 2014 we have succeeded to collect 13 males and 16 females from new spring area in the Korab Mts. Here we describe the unknown female. Like each member in the *Potamophylax winneguthi* species group the female has brachyptery. *Female genitalia* (Figs 89–96). Anal tube formed by the fusion of tergite IX and X is short; setose sternite IX rounded downward directed in

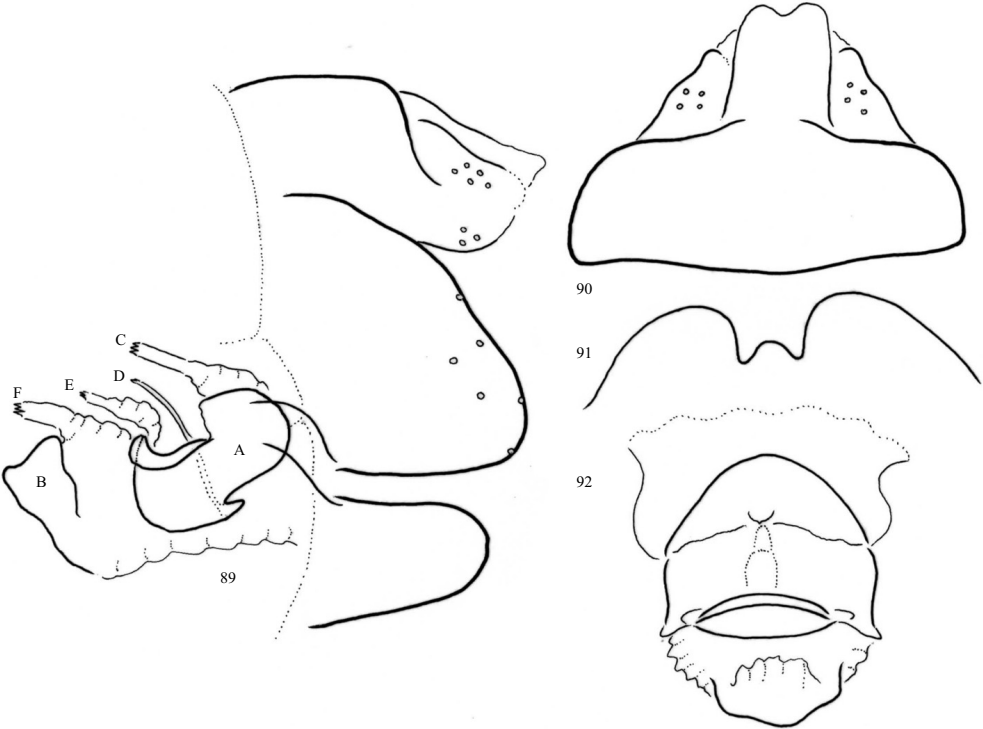


**Figs 75–81.** *Potamophylax kesken* Oláh, 2012: 75 = holotype gonopod in lateral view; 76–78 = gonopods from Korab Mts, 1830 m; 79–81 = gonopods from Korab Mts, 2050 m

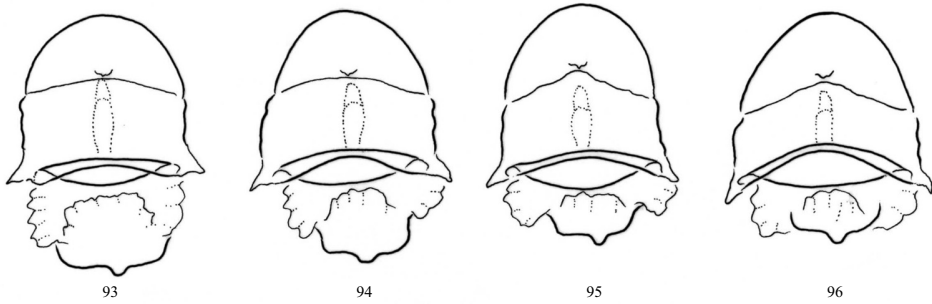


**Figs 82–88.** *Potamophylax kesken* Oláh, 2012: 82 = holotype aedeagus in ventral view; 83–85 = aedeagus from Korab Mts, 1830 m; 86–88 = aedeagus from Korab Mts, 2050 m

lateral view. The dorsal unsetose plate of the anal tube is broad with bilobed apical margin. However the apical portion of the anal tube is less sclerotized, almost membranous and its form is very unstable and highly dependent on copulatory processes. In ventral view the supragenital plate of segment X narrow being compressed by the enlarged sternite IX. Vulvar



**Figs 89–92.** *Potamophylax kesken* Oláh, 2012, female 89 = genitalia with the vaginal sclerite complex in lateral view A = dorsal vaginal sclerite complex, B = suspended ventral vaginal sclerite anteriorad of the membranous vaginal chamber, not posteriorad and not attached to the gonopods of segment IX. C = inlet duct of accessory glands, D = ductus spermathecae, E = ductus bursae, F = common oviduct; 90 = anal tube of the fused segment IX and X in dorsal view; 91 = vulvar scale (lower vulvar lip) in ventral view; 92 = dorsal vaginal sclerite complex in dorsal view



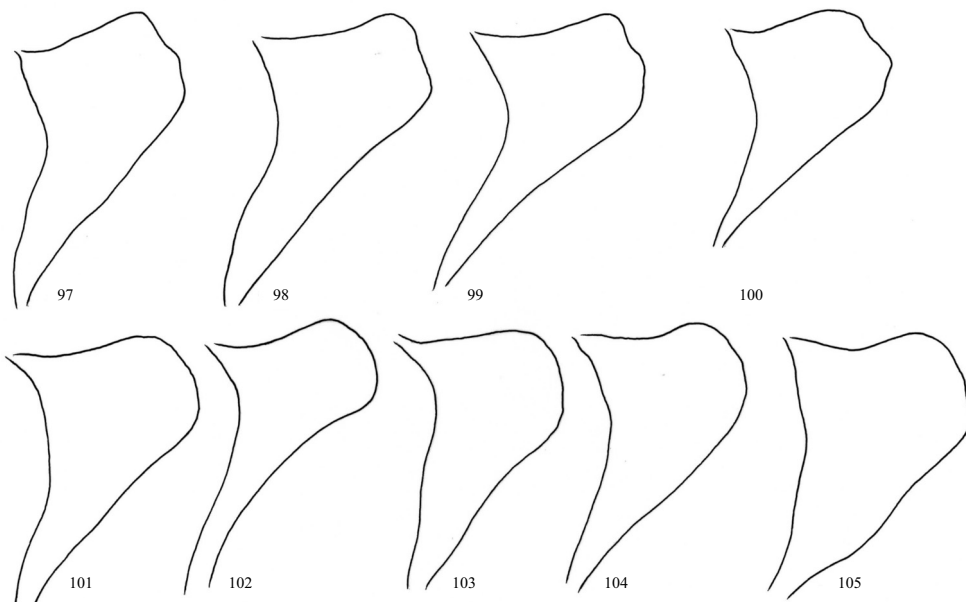
**Figs 93–96.** *Potamophylax kesken* Oláh, 2012, female: 93–96 = dorsal vaginal sclerite complex in dorsal view from Korab Mts, 2050 m

scale (lower vulvar lip) composed of large rounded lateral and small mesal lobe. Vaginal chamber medium sized reaching to the middle of sternite VIII. Ventral sclerite innovation present. The lateral process of the anterior apodeme reduced to an acute-angled sclerotized process and the sclerotized mesal lobe short, less produced.

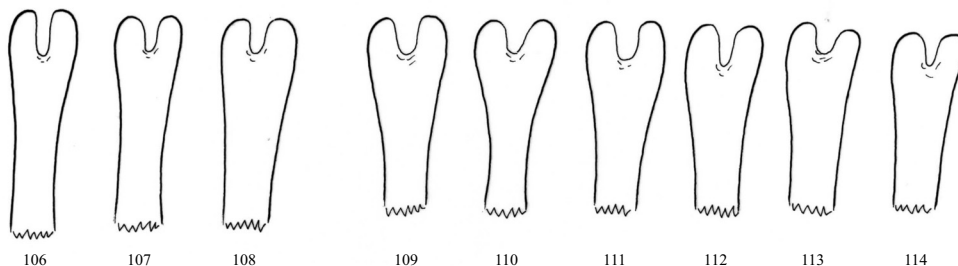
***Potamophylax tagas*** Oláh & Kovács, 2012 (Figs 97–123, 127, 131)

Albania, Dibër district, Korab Mts, 5.5 km SE of Radomirë, spring and open brook, N41°47'20.0", E20°32'23.0", 2330 m, 11.10.2014, JP-KT-PG (14♂, 22♀, 1 copula, OPC; 2♂, 2♀, MM)

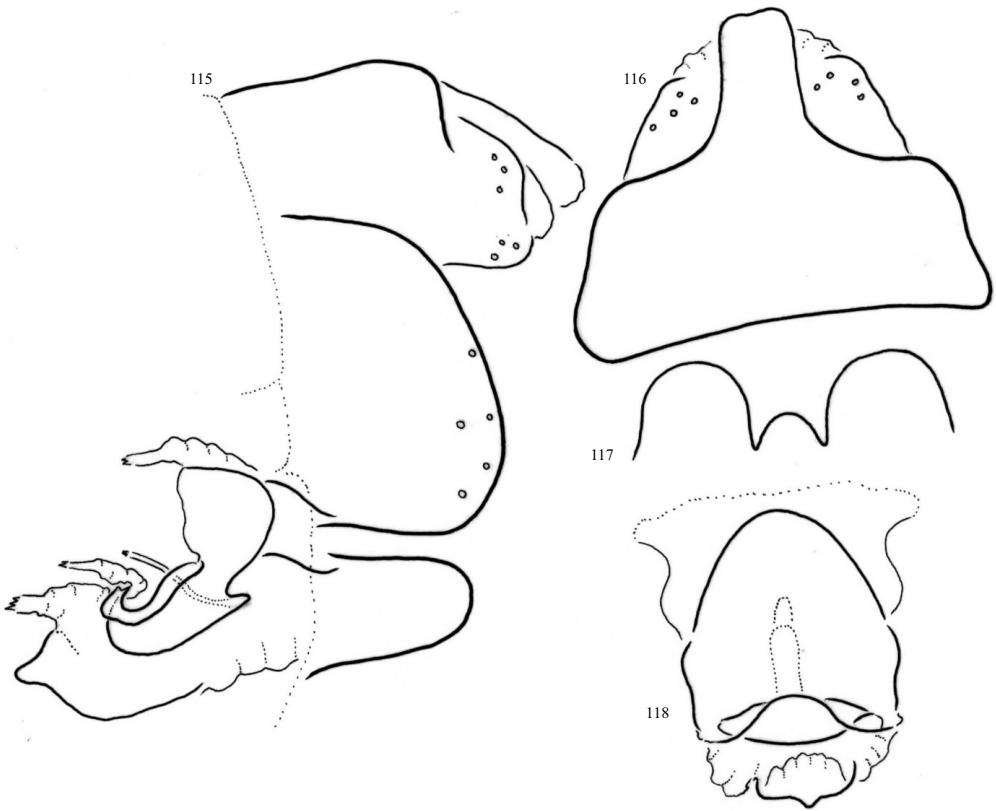
*Female description* (Figs 115–123) – This species was described without female. In 2014 we have succeeded to collect 17 males and 24 females from new spring area in the Korab Mts. Here we describe the unknown female. Like each member in the *Potamophylax winneguthi* species group the female is brachypterious. *Female genitalia* (Figs 115–123). Anal tube



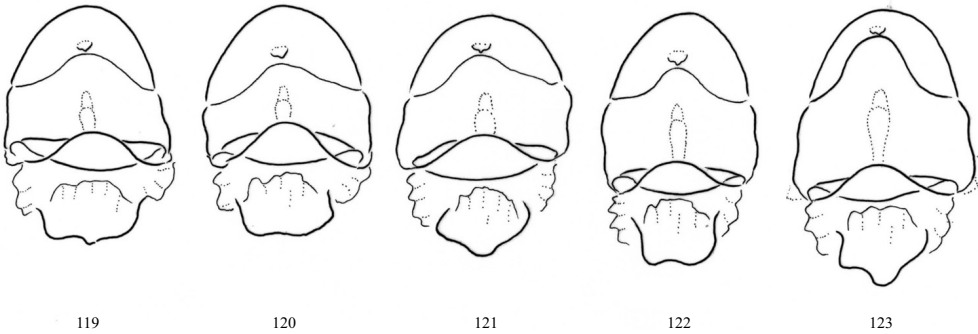
**Figs 97–105.** *Potamophylax tagas* Oláh & Kovács, 2012: 97 = holotype gonopod in lateral view; 98–99 = paratype gonopods; 100–105 = gonopods from Korab Mts, 2330 m



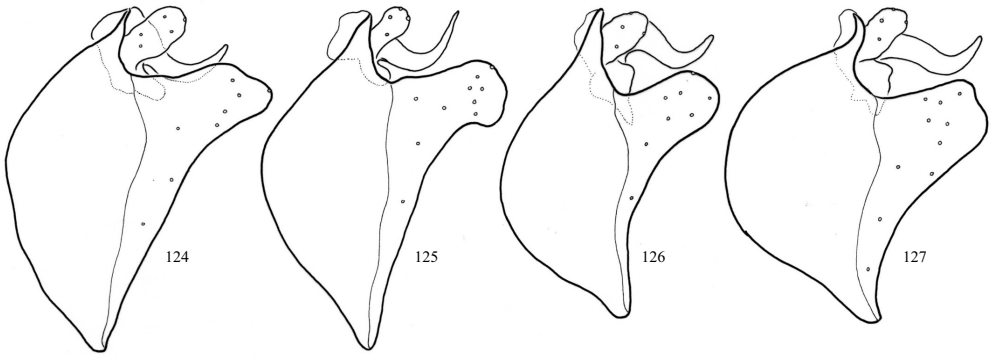
**Figs 106–114.** *Potamophylax tagas* Oláh & Kovács, 2012: 106 = holotype aedeagus in ventral view; 107–108 = paratype aedeagus; 109–114 = aedeagus from Korab Mts, 2330 m



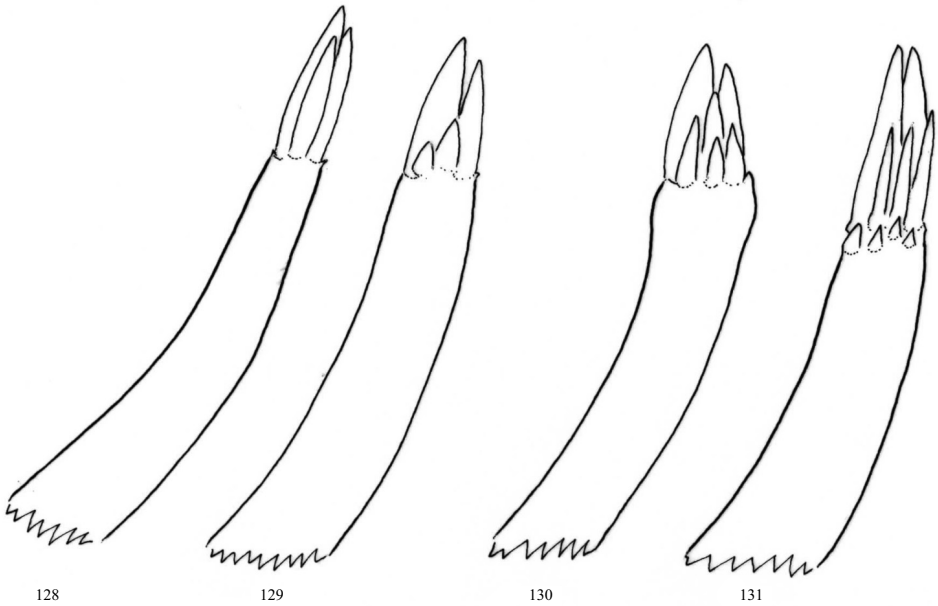
**Figs 115–118.** *Potamophylax tagas* Oláh & Kovács, 2012, female: 115 = genitalia with the vaginal sclerite complex in lateral view; 116 = anal tube of the fused segment IX and X in dorsal view; 117 = vulvar scale (lower vulvar lip) in ventral view; 118 = dorsal vaginal sclerite complex in dorsal view



**Figs 119–123.** *Potamophylax tagas* Oláh & Kovács, 2012, female: 119–123 = dorsal vaginal sclerite complex in dorsal view from Korab Mts, 2330 m



**Figs 124–127.** Comparative lateral view of male genitalia of the *Potamophylax tagas* species cluster.  
 124 = *P. alsos* Oláh sp. n.; 125 = *P. hajlos* Oláh, 2012;  
 126 = *P. kesken* Oláh, 2012; 127 = *P. tagas* Oláh & Kovács, 2012



**Figs 128–131.** Comparative lateral view of left paramere of the *Potamophylax tagas* species cluster.  
 128 = *P. alsos* Oláh sp. n.; 129 = *P. hajlos* Oláh, 2012;  
 130 = *P. kesken* Oláh, 2012; 131 = *P. tagas* Oláh & Kovács, 2012

formed by the fusion of tergite IX and X is short; setose sternite IX rounded slightly downward directed in lateral view. The dorsal unsetose plate of the anal tube is narrow without excision on the apical margin. In ventral view the supragenital plate of segment X narrow being compressed by the enlarged sternite IX. Vulvar scale (lower vulvar lip) composed of large rounded lateral and small mesal lobe. Vaginal chamber medium sized reaching to the middle of sternite VIII. Ventral sclerite innovation present. The lateral

process of the anterior apodeme less sclerotized, almost disappeared and the mesal lobe long, much produced.

*Rhadicleptus alpestris* (Kolenati, 1848) – **Albania**, Bulqizë district, Çermenikë Mts, brooks in open forest beneath Mt. Kaptinë, N41°23.199', E20°17.338', 1600 m, 21.06.2012, FZ-KT-MD (3♂, 3♀, OPC). **Serbia**, Zlatibor district, Zlatibor Mts, Crni Rzav Stream along the road No. 21, N43°40.356', E19°42.125', 1005 m, 14.05.2014, KT-MD (4♂, 1♀, OPC).

*Stenophylax lateralis* (Stephens, 1837) – **Bulgaria**, Haskovo Province, Gorata Mts, Malko Gradiste, brook in a mixed forest S of the village, N41°44.235', E25°58.801', 435 m, 16.03.2012, KJ-MD-SzT (2♂, 1♀, OPC).

*Stenophylax minoicus* Malicky, 1980 – **Greece**, Crete, Rethymno regional unit, Goulediana, olive grove with oak stands at the village, N35°17.206', E24°29.949', 440 m, 01.04.2013, KJ-MD-SzT (1♂, HNHM).

*Stenophylax permistus* McLachlan, 1895 – **Bosnia & Herzegovina**, Banja Luka region, Kozara Mts, Kozarac, Zofik Stream, N44°59.968', E16°52.946', 450 m, 25.05.2012, KT-PG (4♂, OPC).

*Stenophylax sequax* McLachlan, 1875 – **Bosnia & Herzegovina**, Banja Luka region, Kozara Mts, Kozarac, Zofik Stream, N44°59.968', E16°52.946', 450 m, 24.05.2012, UV light 21–22:30, KT-PG (1♂, OPC). **Greece**, Thrace, Rhodope peripheral unit, Sapka Mts, Nea Sanda, open brook and pasture NE of the village, N41°07.965', E25°54.052', 790 m, 26.05.2012, KJ-MD-SzT (1♂, OPC).

#### LEPTOCERIDAE Leach, 1815

*Adicella filicornis* (Pictet, 1834) – **Macedonia**, Polog region, Šar Planina, Bozovce, open brook W of the village, N42°02.759', E20°47.776', 1545 m, 24.06.2014, JP-KT-MD (2♂, 1♀, OPC). **Montenegro**, Kolašin municipality, Manastir Morača, karst spring and its outlet at the monastery, N42°45.942', E19°23.436', 300 m, 14.06.2012, FZ-KT-MD (2♂, OPC).

*Adicella syriaca* Ulmer, 1907 – **Greece**, South Aegean, Rhodes regional unit, Epta Piges, karst springs and their outlet, N36°15.195', E28°06.859', 80 m, 10.11.2012, KJ-MD (6♂, HNHM).

*Athripsodes albifrons* (Linnaeus, 1758) – **Albania**, Korçë district, Opari area, Moglicë, torrent in bushy flysh vegetation E of the village, N40°42.387', E20°25.067', 500 m, 27.06.2014, JP-KT-MD (1♂, OPC).

*Athripsodes bilineatus* (Linnaeus, 1758) – **Serbia**, Zlatibor district, Zlatibor Mts, Crni Rzav Stream along the road No. 21, N43°39.731', E19°42.575', 1010 m, 13.06.2012, FZ-KT-MD (2♂, OPC).

*Mystacides nigra* (Linnaeus, 1758) – **Serbia**, Zlatibor district, Zlatibor Mts, Crni Rzav Stream along the road No. 21, N43°39.731', E19°42.575', 1010 m, 13.06.2012, FZ-KT-MD (1♂, OPC).

*Setodes punctatus* (Fabricius, 1793) – **Albania**, Shkodër district, Omarë, spring fed lake and its outlet W of the village, N42°09.226', E19°27.827', 10 m, 27.06.2014, JP-KT-MD (1♂, ♀, OPC).

*Trienodes ochreellus* McLachlan, 1877 – **Albania**, Shkodër district, Omarë, spring fed lake and its outlet W of the village, N42°09.226', E19°27.827', 10 m, 27.06.2014, JP-KT-MD (2♂, 10♀, OPC).

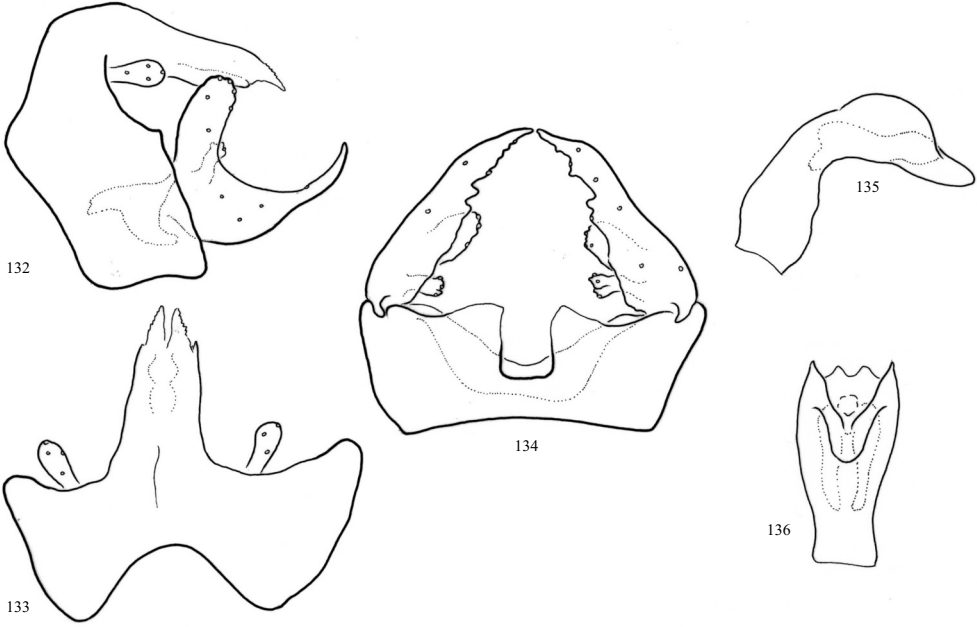
#### BEREIDAE Wallengren, 1891

##### *Beraea gurba* Oláh sp. n. (Figs 132–139)

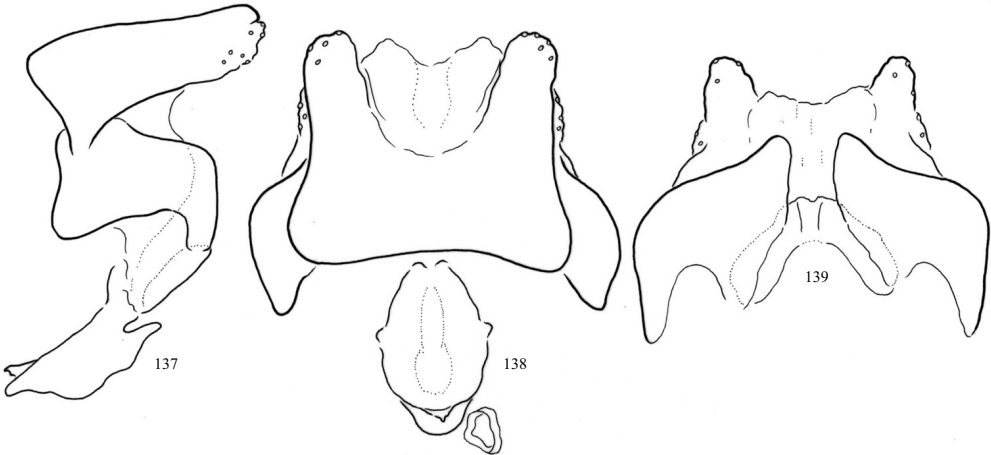
*Diagnosis* – Similar to *Beraea zawadil* Malicky, 1977 described from Greece, but differs by the shorter segment IX, by the differently shaped gonopods and by the highly bent and four tipped phallic organ.

*Description* – Male (in alcohol). Sclerites on body and legs castaneous brown. Scapus maxillary and labial palps, head and thoracic setal warts and intersegmental membranes snow white. Elongated scapus with anteriomesal process. Unpaired white mesal digitiform setose projection arisen from clypeal region spreading between scapes. Under this elongated white projection a similar but black and more sclerotized projection is present arisen from frontal region. Both processes reach up to the elevated vertex. White vertexal antennal and occipital setose warts modified into elevated processes. Maxillary palp formula I-III-IV-II-V. Mesothorax with two small rounded scutal and two longitudinally larger ovoid scutellar

setal warts. Forewing with rounded callosity followed by long groove filled with scale-shaped seate. Forewing length 5 mm. Scapus, clypeal and frontal projections and forewing callosity are sexual dimorphic traits of the males, absent on females.



**Figs 132–136.** *Beraea gurba* Oláh sp. n. male holotype: 132 = genitalia in lateral view; 133 = segment IX-X and cerci in dorsal view; 134 = segment IX and gonopods in ventral view; 135 = phallic organ in lateral view; 136 = phallic organ in ventral view



**Figs 137–139.** *Beraea gurba* Oláh sp. n. female allotype: 137 = genitalia with dorsal vaginal sclerite complex in lateral view; 138 = genitalia with dorsal vaginal sclerite complex in dorsal view; 139 = genitalia in ventral view



Male genitalia (Figs 132–136). Segment IX short with short triangular projection middle on the anterior margin. Segment X with pointed bifid ending. Vestigial paraprocts fused to lateral margin of segment X, represented by strong sclerotized bands. Cerci clavate. Three-branched gonopods composed of broad dorsal arm, slender ventral arm irregularly serrated mesad and irregularly formed small projection directed mesad, gonopods widely separated and articulated to segment IX by pivot or fulcrum process, highly sclerotized; basal plate attached to gonopod base by narrow band and forming a broad plate trough to supply ventral support to the phallic organ. Phallic organ bent in lateral view ending in four-tipped pattern dorsally subapical; a pair of strongly sclerotized internal sclerite present midway.

Female genitalia (Figs 137–139). Sternum VIII carries a strong sclerotized unpaired mesal and submarginal tooth; this tooth not split on the allotype, but bifid on a single paratype. Tergite IX bilobed with wide U-shaped dorsal excision; apex and sublateral region of the lateral lobes setose; sternum IX with sclerotized S-shaped lateral margins in ventral view covering partly the strongly sclerotized vulvar scale, the lower vulvar lip (fused gonopods segment VIII and IX). Segment X located partly inside tergite IX, mostly membranous, with two small slightly sclerotized dorsal bands inside the U-shaped excision of tergite IX; its ventral part entirely membranous serving as upper vulvar lip.

*Type material* – Holotype. **Albania**, Pukë District, rocky stream above Blinisht, N42.08290°, E19.96340°, 13.05.2014, 1010 m, BZ-PD-PG (1♂, OPC). Allotype. Same as holotype (1♀, OPC). Paratypes. Same as holotype (6♂, 1♀, OPC).

*Etymology* – *gurba*, from “girbe-gurba”, meandering in Hungarian, refers to the meso-marginal profile of gonopod ventral branch as visible in ventral view.

*Beraea maurus* (Curtis, 1834) – **Macedonia**, Polog region, Šar Planina, Bozovce, open brook W of the village, N42°02.759', E20°47.776', 1545 m, 24.06.2014, JP-KT-MD (1♂, OPC).

*Beraea pullata* (Curtis, 1834) – **Macedonia**, Vardar region, Kožuf Mts, pond and open brook in alpine grassland towards Ski Kožuf, N41°12.565', E22°13.158', 1660 m, 25.06.2014, JP-KT-MD (12♂, 6♀, OPC).

*Beraemyia schmidi* Botosaneanu, 1960 – **Montenegro**, Podgorica municipality, Dinosa, Cijevna River at the village, N42°24.382', E19°20.990', 80 m, 15.06.2012, FZ-KT-MD (1♂, 1♀, OPC).

*Ernodes kakofonix* Malicky, 1979 – **Greece**, Crete, Rethymno regional unit, Mirthios, D. Dason Rethymnis spring E of the village, N35°17.619', E24°33.360', 155 m, 01.04.2013, KJ-MD-SzT (21♂, HNHM).

#### SERICOSTOMATIDAE Stephens, 1836

*Notidobia ciliaris* (Linnaeus, 1761) – **Bosnia & Herzegovina**, Una-Sana Canton, Grmeč Mts, Krnjeuša, spring area, N44°42.151', E16°13.739', 560 m, 26.05.2012, KT-PG (3♂, OPC). **Serbia**, Zlatibor district, Zlatibor Mts, spring brook of Crni Rzav Stream beneath Mt. Cigota, N43°37.932', E19°46.305', 1160 m, 13.06.2012, FZ-KT-MD (4♂, 3♀, OPC).

*Notidobia nekibe* Klapálek, 1903 – **Albania**, Elbasan district, Shushice, Burimi te Byshekut, limestone rocks stream, N41.1005°, E20.1249°, 175 m, 17.04.2014, Z. FZ-Tamás Németh-Edvárd Mizsei (1♂, 1♀, OPC). Kolonjë district, Barmash, large spring and its outlet in tall rush stands, NE of the village, N40°17.034', E20°37.814', 955 m, 11.05.2014, KT-MD (12♂, 3♀, OPC). Kolonjë district, Grammos Mts, Rehovë, forest brook E of the village, N40°20.111', E20°43.467', 1445 m, 11.05.2014, KT-MD (4♂, OPC). Kolonjë district, Grammos Mts, Rehovë, spring at the Rehovë Manastir, N40°20.019', E20°42.968', 1265 m, 11.05.2014, KT-MD (3♂, 1♀, OPC). Pukë District, rocky stream above Blinisht, N42.08290°, E19.96340°, 1010 m, 13.05.2014, BZ-PD-PG (1♂, 4♀, OPC). Sarandë District, Vrinë, shore of river Lumi i Pavllës, N39.71786°, E20.02033°, 10 m, 08.05.2014, BZ-PD-PG (2♂, 1♀, OPC). **Greece**, West Macedonia, Grevena peripheral unit, Zakas, spring by the Venetikos River NE of the village, N40°02.285', E21°17.323', 690 m, 09.05.2014, KT-MD (4♂, 1♀, OPC). West Macedonia, Kozani

peripheral unit, Neopoli, Aliakmonas River NE of the city, N40°19.976', E21°24.678', 555 m, 08.05.2014, KT-MD (8♂, 1♀, OPC). **Macedonia**, Polog region, Šar Planina, Bozovce, open brook W of the village, N42°02.759', E20°47.776', 1545 m, 24.06.2014, JP-KT-MD (2♂, OPC). Vardar region, Kožuf Mts, open brook in bushy alpine grassland towards Ski Kožuf, N41°11.968', E22°13.550', 1610 m, 25.06.2014, JP-KT-MD (1♂, OPC). *Notidobia salihli* Malicky & Sipahiler, 1993 – **Macedonia**, Polog region, Šar Planina, Bozovce, open stream, brooks and seeps W of the village, N42°03.147', E20°46.920', 1880 m, 24.06.2014, JP-KT-MD (6♂, 1♀, OPC). *Oecismus monedula* (Hagen, 1859) – **Macedonia**, Vardar region, Kožuf Mts, open brook in bushy alpine grassland towards Ski Kožuf, N41°11.968', E22°13.550', 1610 m, 25.06.2014, JP-KT-MD (1♂, OPC). *Sericostoma schneiderii* (Kolenati, 1848) – **Albania**, Delvinë District, Krongj, stream Vrasi, N39.91720°, E20.18245°, 140 m, 09.05.2014, at light, BZ-PD-PG (6♂, 3♀, OPC). Pogradec district, Piskupat, Ohrid Lake at Hotel Leon S of the village, N41°01.152', E20°38.196', 695 m, 12.05.2014, KT-MD (1♀, OPC). **Bosnia & Herzegovina**, Una-Sana Canton, Mrazovac, stream at open spring, N45°02'42.0", E16°05'19.7", 246 m, 26.05.2012, KT-PG (3♂, OPC).

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