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## On the Trichoptera of the Caucasus with western and eastern relatives

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**Abstract.** This caddisfly study is based mostly on the material collected in the framework of the International Visegrad Fund research project on the aquatic insects of Georgia and Azerbaijan. Applying the principles and procedures of fine phenomics we have delineated and characterised several Trichoptera species complexes; reinstated the species status of *Hydropsyche derek* Oláh & Kiss, 2015 stat. rest., *Badukiella subnigra* Oláh, 1985 stat. rest., *Rhyacophila aliena* Martynov, 1916 stat. rest., *Stenophylax caspicus* (Schmid, 1959) stat. rest., *Stenophylax lasarea* (Oláh, 1985) stat. rest.; raised the subspecies status to species rank of *Halesus caucasicus* Oláh, 1985 stat. nov. and *Potamophylax armeniacus* Mey, 1979 stat. nov.; described the *Sakala* gen. nov. in the Limnephilini tribe; and furthermore 70 species new to science: *Wormaldia davidi* Oláh & Vinçon sp. nov., *W. elvesta* Oláh sp. nov., *W. harma* Oláh & Vinçon sp. nov., *W. holaga* Oláh & Manko sp. nov., *W. hoska* Oláh sp. nov., *W. kimera* Oláh & Vinçon sp. nov., *W. kitera* Oláh sp. nov., *W. obola* Oláh sp. nov., *W. sakaorum* Oláh sp. nov., *W. tomora* Oláh & Vinçon sp. nov., *Diplectrona albanica* Oláh sp. nov., *D. georgica* Oláh & Vinçon sp. nov., *D. serbica* Oláh sp. nov., *Hydronema turkestanica* Oláh sp. nov., *Hydropsyche harmada* Oláh sp. nov., *H. rovnaka* Oláh sp. nov., *H. togana* Oláh & Kerimova sp. nov., *H. pupka* Oláh sp. nov., *H. sukula* Oláh sp. nov., *H. ejsaka* Oláh sp. nov., *Agapetus gouriensis* Oláh & Vinçon sp. nov., *Rhyacophila kveda* Oláh & Vinçon sp. nov., *R. nakra* Oláh & Vinçon, *R. zekara* Oláh & Vinçon sp. nov., *R. gouria* Oláh & Vinçon sp. nov., *R. mirala* Oláh & Vinçon sp. nov., *R. ordua* Oláh sp. nov., *R. rizea* Oláh sp. nov., *R. sacokia* Oláh & Vinçon sp. nov., *R. trabzona* Oláh sp. nov., *R. iranica* Oláh sp. nov., *R. kora* Oláh sp. nov., *R. pakistanica* Oláh sp. nov., *R. kimara* Oláh & Vinçon sp. nov., *Apataniana bacurianica* Oláh & Vinçon sp. nov., *A. goderdza* Oláh & Kovács sp. nov., *A. kintrisha* Oláh & Vinçon sp. nov., *Drusus erdes* Oláh & Vinçon sp. nov., *D. sukul* Oláh & Vinçon sp. nov., *D. teslenkoae* Oláh & Vinçon sp. nov., *D. alapos* Oláh sp. nov., *D. chechensis* Oláh sp. nov., *D. csupasz* Oláh sp. nov., *D. johansonii* Oláh sp. nov., *D. megnot* Oláh & Vinçon sp. nov., *D. mankoi* Oláh sp. nov., *D. janjulae* Oláh sp. nov., *Sakala adjarica* Oláh & Vinçon sp. nov., *Badukiella kinula* Oláh & Vinçon sp. nov., *B. kurta* Oláh & Vinçon sp. nov., *Chaetopteryx vinconi* Oláh & Kovács sp. nov., *Kelgena adjarica* Oláh & Kovács sp. nov., *K. bakurianica* Oláh & Vinçon sp. nov., *K. bunka* Oláh & Vinçon sp. nov., *K. imeretica* Oláh & Vinçon sp. nov., *K. meyi* Oláh sp. nov., *K. parhuza* Oláh & Vinçon sp. nov., *K. svanetica* Oláh & Vinçon sp. nov., *K. tolaka* Oláh & Kovács sp. nov., *K. topora* Oláh & Vinçon sp. nov., *Rizeiella bayae* Vinçon & Oláh sp. nov., *R. ereda* Oláh & Vinçon sp. nov., *R. odva* Oláh & Vinçon sp. nov., *R. oldala* Oláh & Kovács sp. nov., *R. tavola* Oláh & Vinçon sp. nov., *Halesus kampos* Oláh sp. nov., *H. karmos* Oláh sp. nov., *Stenophylax vallas* Oláh & Kovács sp. nov., *S. ujjas* Oláh & Kovács sp. nov., *Ernodes ordubadensis* Oláh & Kerimova sp. nov.

**Keywords.** Caucasus, Trichoptera, fine phenomics, new genus, new species.

### INTRODUCTION

Launched in 2018, two years long International Visegrad Fund research project was initiated to study the biodiversity of aquatic insects in the Caucasian countries of Georgia and Azerbaijan.

This project was lead by the University of Prešov (Slovakia) and implemented together with partners from the Hungarian Natural History Museum (Budapest, Hungary), University of South Bohemia (Czech Republic), University of Łódź (Poland), Ilia State University (Georgia), Azerbaijan

National Academy of Sciences (Azerbaijan). Started to work on the project's material originally we planned to revise and analyse all the known endemic Caucasian species of Trichoptera. However, it became clear at the very beginning that it is still a premature idea: just in the first samples of the project we have found a surprisingly large number of unknown caddisflies. The total number of known endemic Caucasian caddisflies described from the Caucasian countries of Armenia, Azerbaijan, Georgia, and Russia is not much higher. It amounts only to 89 species (Morse 2020). Our finding of 70 new species in samples collected from only a limited area of the Caucasus directly and clearly indicates that our knowledge of the aquatic biodiversity on the huge territory of the Caucasian mountain ranges is very poor. This is confirmed also by recent Trichoptera studies having discovered and described 35 new endemic species just on a very small region in northeastern Turkey, nearby the Lesser Caucasus (Sipahiler, 2005, 2008). Part of the Caucasian region is still almost virgin, untouched. Without specialized biodiversity studies on the caddisflies most of the mountain ranges remained unexplored. Applying the principles and procedures of fine phenomics here we describe one new genus and 70 new species of caddisflies mostly from Georgia and Azerbaijan based upon the samples of adult caddisflies collected in the limited capacity of this single project.

We dedicate this paper to the distinguished Russian paleoentomologist, specialist of insect wing as well as great trichopterologist and plecopterologist **Andrei Vasilievich Martynov** (1879–1938), a contemporary of R. P. Longinos Navas, S. J. and Nathan Banks. He has created the basic knowledge on the Trichoptera of the Caucasus, beside of many other regions in Asia. His capacity to describe structures and especially his talent to draw genital structures are ultimate. Compare his published drawings with his contemporaries! He was a great insect collector par-

ticipating in several long lasting expeditions when the roads were not as good as now. He visited collecting sites in the highest parts of the Caucasus, often necessitating long walks on dangerous but wonderful mountain paths.

## MATERIALS AND METHODS

This study was based mostly on the material collected during the years of 2018–2019 by the International Visegrád Fund project led by Peter Manko and realised by an international team from Azerbaijan, Czech Republic, Georgia, Hungary and Slovakia. Particularly the caddisfly collecting effort was enforced and the laboratory studies were supported by private financial funding of the first two authors János Oláh and Gilles Vinçon. Material was also collected by Pavel Chvojka during his bilateral research projects in Armenia and Georgia as well as relevant comparative material was studied from several western and eastern regions of the Caucasus. Specimens have been deposited as indicated in the paragraphs of examined material.

### *Depositories.*

Hungarian Natural History Museum, Budapest, Hungary (HNHM)

Mátra Museum of Hungarian Natural History Museum, Gyöngyös, Hungary (MM)

Museum der Natur, Gotha, Germany (MNG)

Museum for Natural History of the Humbolt University of Berlin, Germany (ZMB)

Naturalis Biodiversity Center, Zoological Museum, Amsterdam, Netherland (NBC-ZMAN)

National Museum of Natural History, Sofia, Bulgaria (NMNHS)

National Museum, Prague, Czech Republic (NMPC)

Oláh Private Collection, Debrecen, Hungary, under national protection by the Hungarian Natural History Museum, Budapest (OPC)

Swedish Museum of Natural History, Stockholm, Sweden (SMNH)

Zoological Institute, Leningrad, Russia (ZIL)

**TAXONOMY**

**Annulipalpia**

**Superfamily Philopotamoidea**

**Family Philopotamidae**

***Philopotamus achemenus* Schmid, 1959**

*Material examined.* **Azerbaijan**, Nakhchivan AR, Ordubad District, Tivi village, river Tivi, sweep netting, N39°8'0.24", E45°55'47.07", 25.VI.2019, leg. I. Kerimova (4 males, 2 females, OPC).

***Philopotamus tenuis* Martynov, 1913**

*Material examined.* **Georgia**, Mtskheta-Mtianeti region, Gveleti, Tibistskali Stream above its mouth to Terek River N42°42.605', E44°37.597', 1440m, 12.VII.2019, leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (1 male, 1 female, OPC). **Georgia**, Imereti region, brooks, springs, cascade, Tsablarastskali tributaries, above Kur Sairmi, N41°52'09" E42°47'34", 1700m, 17.VII.2019, leg. G. Vinçon (1 male, OPC).

***Dolophilodes ornata* Ulmer, 1909**

*Material examined.* **Georgia**, Kakheti region, Napareuli, Lopota Lake and its inlet brook, N42°03.407' E45°31.636', 475m, 1.V.2019, leg. D. Murányi *et al.* (2 males, OPC).

***Wormaldia* McLachlan, 1865**

In our recent revision of the European species of the *Wormaldia* genus (Oláh *et al.* 2019a) we have selected six genital characters in order to delimit species and delineate lineages of higher taxonomical hierarchies by the principles of character combination necessitated by the chimeric nature of living entities. Chimerism is the basic architecture of living organisation and every organisms are composed of different origin. Genomes and phenomes are tree-like on the surface, but reticulated inherently in the deep. In the study and in the description of the Caucasian *Wormaldia* we follow the same character combinations:

Non-adaptive, neutral traits: (1) Dorsal view of the mesoapical excision on tergite VIII; (2) Lateral view of harpago, the oldest divergence among the selected six genital characters; (3) Lateral view of cerci; (4) Dorsal view of cerci. Adaptive, non-neutral speciation traits: (5) Lateral profile of the head of segment X. (6) Lateral view of the endothecal spine pattern in the phallic organ.

Incipient phylogenetic species are delimited by the speciation trait of the lateral profile of the head of segment X. Species clades in the *Wormaldia subnigra* species complex of the *W. triangulifera* species group are distinguished by the combination of the lateral shape of the dorsal concavity of the head of segment X and of the endothecal spine pattern. Species complexes in the *Wormaldia triangulifera* species group are distinguished by the combination of the lateral profile of the head of segment X and by the endothecal spine pattern. Species groups in the European species of the *Wormaldia* genus are distinguished by the lateral profile of the harpagones.

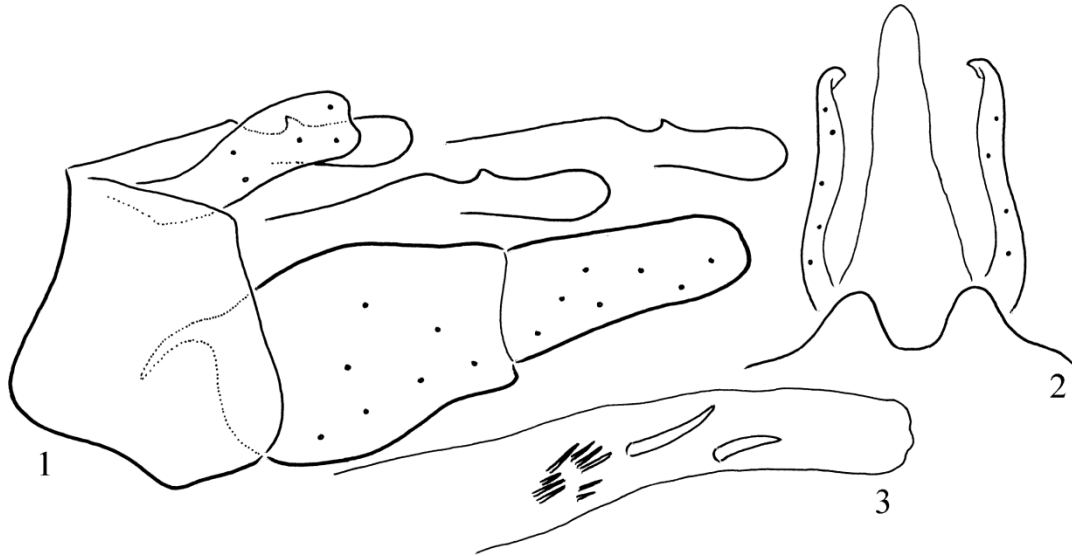
Following the character combination and the delineation principles of the higher taxonomic hierarchies in lineage sorting here we report all the species collected and describe all the new species.

***Wormaldia davidi* Oláh & Vinçon, sp. nov.**

(Figures 1–3, Map 1, Photo 1–2)

*Material examined.* Holotype: **Georgia**, Mingrelia and High Svanetia region, Khaishura River tributary, same torrent above Kveda Vedi until its spring, N42°54'47", E42°11'05", 1300–1500m 22.IX.2019, leg. G. Vinçon (1 male, OPC).

*Diagnosis.* A single male specimen was collected and available for description, but easily distinguishable from all the known species by very particular character combination. This is a truly chimeric species difficult to classify, composed of characters even from several species complexes or even species groups. Most of its



**Figures 1–3.** *Wormaldia davidi* Oláh & Vinçon, sp. nov. Holotype: 1 = male genitalia in left lateral view with additional redrawn lateral profiles of the head of segment X, 2 = mesal excision on tergite VIII and segment X with cerci in dorsal view, 3 = phallic organ with the endothecal spine pattern in left lateral view.

characters relate this interesting species to the *Wormaldia triangulifera* species group, but has almost parallel-sided elongated harpago of the *W. occipitalis* species group. Its classification inside the *W. triangulifera* species group is obscured by having dorsal concavity of segment X head of the *W. subnigra* complex and small spine cluster in the endotheca of the *W. bulgarica* and *W. khourmai* species complexes.

*Description.* Male (in alcohol). Small castaneous 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 formed by pronounced lateral lobes. Segment X characterized by a dorsal small pointed subapical process visible in lateral view; the head is elongated and characterized by dorsal concavity. Cerci with slightly excised apex. Gonopods, both coxopodite and harpago short and high (broad), almost equal in length; harpagones with less pointed apex, almost parallel-sided as visible in lateral view. Phallic organ with eversible membranous

endotheca containing one long and one smaller stout spine accompanied by a small cluster of small spines.

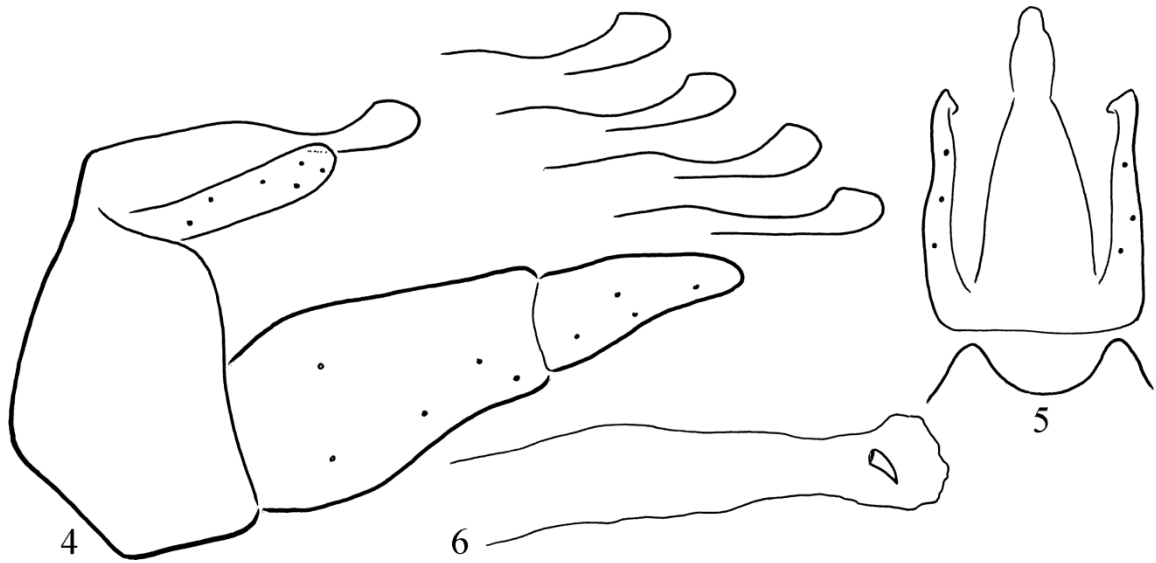
*Etymology.* We named this chimeric species, in honour to David Murányi, the well-known plecopterist, who was the Hungarian counterpart in this International Visegrád Found research project on the Caucasian aquatic insects.

***Wormaldia elvesta* Oláh, sp. nov.**

(Figures 4–6, Map 1)

*Material examined.* Holotype: **Azerbaijan**, Gədəbəy district, Gədəbəy, degraded forest seeps and brook S of the village, N40°28.012' E45°46.061', 1635m, 1.X.2019, leg. T. Kovács, P. Manko & D. Murányi (1 male, OPC).

*Diagnosis.* This new species is easily distinguished from all the known species by its highly reduced endothecal spine of having only a single small, stout spine. Having tapering harpago it belongs to the *Wormaldia triangulifera* species group, but having relations both to the *W. bulgarica* and *W. khourmai* species complexes.



**Figures 4–6.** *Wormaldia elvesta* Oláh, sp. nov. Holotype: 4 = male genitalia in left lateral view with additional redrawn lateral profiles of the head of segment X, 5 = mesal excision on tergite VIII and segment X with cerci in dorsal view, 6 = phallic organ with the endothecal spine pattern in left lateral view.

*Description.* Male (in alcohol). Small castaneous 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 6 mm. Spur formula is 244.

*Male genitalia.* Tergit VIII with deep and wide mesal excision on the apical margin formed by pronounced lateral lobes. Segment X characterized by a dorsal less pronounced pointed subapical process visible in lateral view; the head is slightly elongated. Cerci with rounded apex. Harpago tapering short, almost half as long as coxopodit. Phallic organ with a single small spine.

*Etymology.* *elvesta*, euphemic coin of “elvezett” lost in Hungarian, refers to the almost total disappearance of the endothecal spines.

***Wormaldia harma* Oláh & Vinçon, sp. nov.**

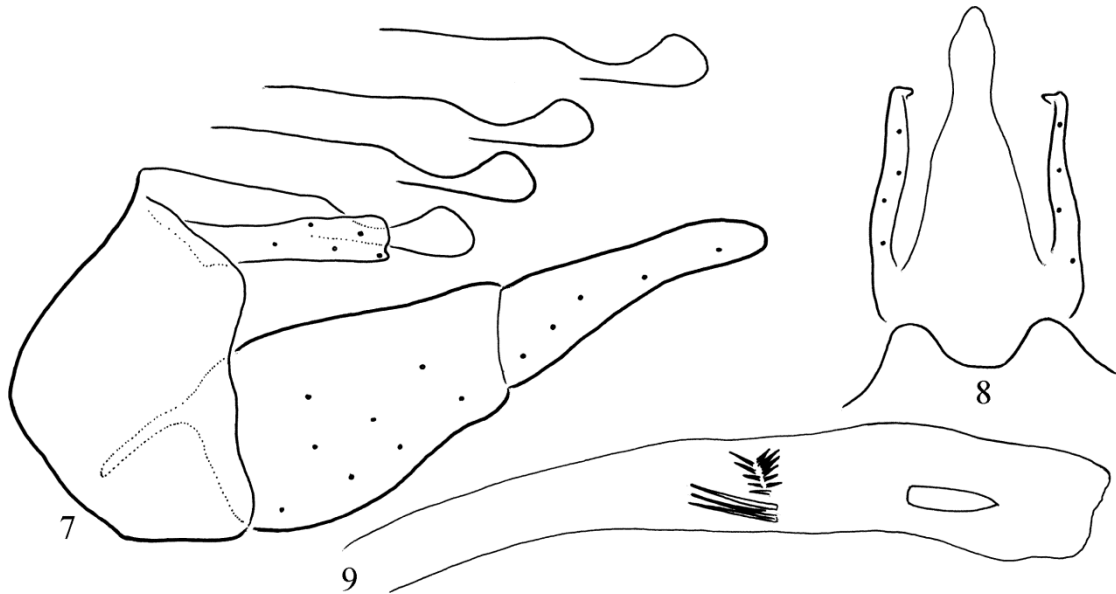
(Figures 7–9, Map 1, Photo 3–4)

*Material examined.* Holotype: **Georgia**, Mingrelia and High Svanetia region, brooklet and spring NW above the camping place, Nakra valley, Utviri tributary, 43°04'49" N, 42°19'41" E, 2300–2500m, 23.IX.2019, leg. G. Vinçon (1 male,

OPC). Paratypes: same as holotype (5 males, 3 females in copula, OPC). Georgia, Mingrelia and High Svanetia region, spring, Nakra valley, Utviri tributary, 43°04'47" N, 42°21'57" E, 1620m, 23.IX.2019, leg. G. Vinçon (1 male, 1 female in copula, OPC). Georgia, Mingrelia and High Svanetia region, steep brook and spring, Nakra valley, Utviri tributary, 43°04'36" N, 42°20'11" E, 2300m, 23.IX.2019, leg. G. Vinçon (3 males, NMPC).

*Diagnosis.* This new species is easily distinguished from all the known species by the character combination of anterad obliquely sloping head of segment X, single stout spine in the three slender long spines in the endotheca. Having tapering harpago it belongs to the *Wormaldia triangulifera* species group, and having only a single stout spine of the *W. bulgarica* species complex. Most close to *W. kumanskii*, but differs by the anterad obliquely sloping head of segment X.

*Description.* Male (in alcohol). Small castaneous 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 7 mm. Spur formula is 244.



**Figures 7–9.** *Wormaldia harma* Oláh & Vinçon, sp. nov. Holotype: 7 = male genitalia in left lateral view with additional lateral profiles of the head of segment X of three paratypes from different populations, 8 = mesal excision on tergite VIII and segment X with cerci in dorsal view, 9 = phallic organ with the endotheal spine pattern in left lateral view.

**Male genitalia.** Tergit VIII with deep and wide mesal excision on the apical margin formed by pronounced lateral lobes. Segment X characterized by a dorsal less pronounced pointed subapical process visible in lateral view; the head obliquely sloping anterad. Cerci with truncate apex. Harpago tapering long, with slightly downward turning apical region, almost as long as coxopodit. Phallic organ with a single small stout spine accompanied by a small cluster of small and short spines as well as by three longer and slender spines.

**Etymology.** *harma*, euphemic coin of “három” three in Hungarian, refers to the three long and slender spines located near to the cluster of small spines.

***Wormaldia holaga* Oláh & Manko, sp. nov.**

(Figures 10–12, Map 1, Photo 13)

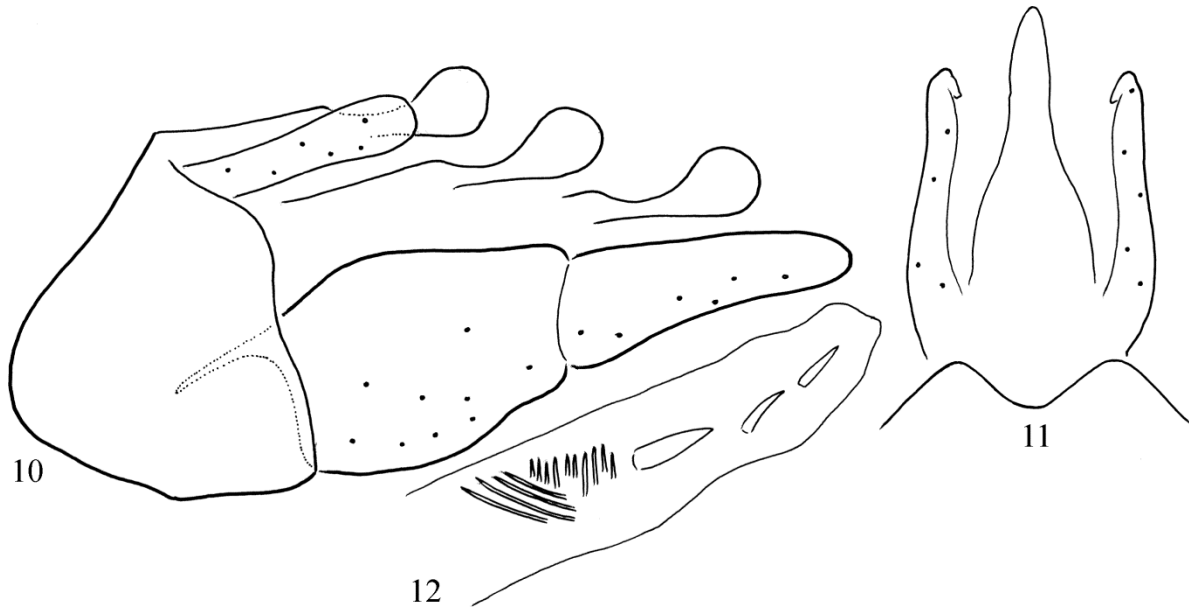
**Material examined.** Holotype: **Georgia**, Mtskheta-Mtianeti region, sidestream of Terek r. with small waterfall in narrow rocky ravine, below Tsdo village, 42°40'56.379"N, 44°37' 58.846"E, 1710m, 6.VII.2019, leg. P. Manko (1 male, OPC).

**Diagnosis.** This new species is easily distinguished from all the known species by the blister/bladder shape head of segment X. Having tapering harpago it belongs to the *Wormaldia triangulifera* species group, and having three stout spines of the *W. khourmai* species complex. Most close to *W. kera*, but differs by the blister shape head of segment X.

**Description.** Male (in alcohol). Small castaneous 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 5 mm. Spur formula is 244.

**Male genitalia.** Tergit VIII with deep triangular mesal excision on the apical margin without pronounced lateral lobes. Segment X characterized by a lateral profile of an almost regular blister/bladder shape. Cerci with rounded apex. Harpago tapering long, with slightly downward turning apical region, almost as long as coxopodit. Phallic organ with a large stout spine accompanied by a pair of slender stout spines and small cluster of small and short spines as well as by some longer and slender spines.





**Figures 10–12.** *Wormaldia holaga* Oláh & Manko, sp. nov. Holotype: 10 = male genitalia in left lateral view with additional redrawn lateral profiles of the head of segment X, 11 = mesal excision on tergite VIII and segment X with cerci in dorsal view, 12 = phallic organ with the endothecal spine pattern in left lateral view.

*Etymology.* *holaga*, euphemic coin of “hólyag” blister/bladder in Hungarian, refers to the regular rounded circular lateral profile of the head of segment X.

***Wormaldia hoska* Oláh, sp. nov.**

(Figures 13–15, Map 1, Photo 47)

*Material examined.* **Azerbaijan**, Şəki district, Şəki, Quirxbulaq, karst brook in deciduous forest, N41°08.786' E47°15.532', 595m, 6.V.2019, leg. T. Kovács, P. Manko & D. Murányi (1 male, OPC).

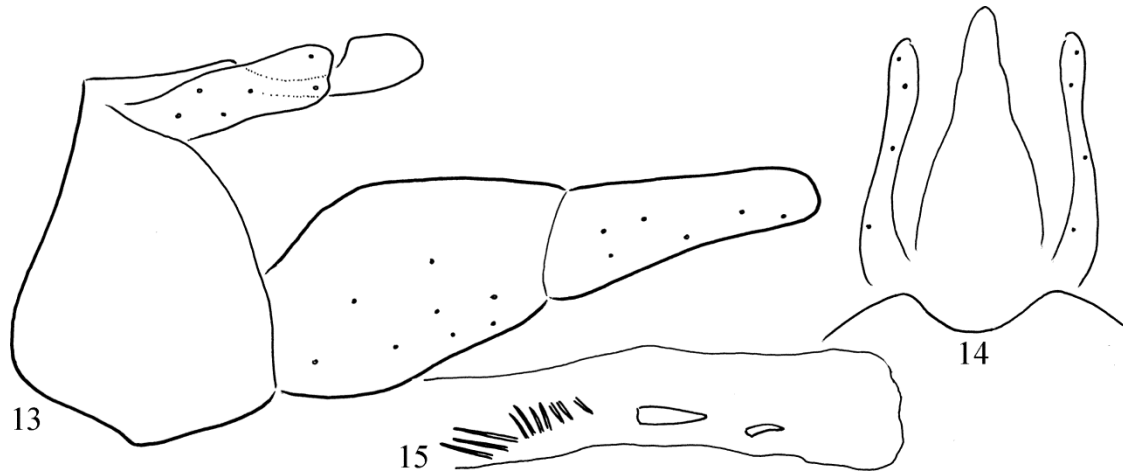
*Diagnosis.* This new species is distinguished from all the known species by the character combination of elongated head of segment X, two endothecal stout spines, one large and one small, truncate apex of cerci and the deep and wide apical excision of tergite VIII. Having tapering harpago it belongs to the *Wormaldia triangulifera* species group, and having two stout spines of the *W. khourmai* species complex. Most close to *W. kitera* sp. nov., but differs by the elongated head of segment X and by the unequal pair of stout

spines. Also close to its other sibling, *W. sakaorum* sp. nov. described from higher elevation in Saki district, but differs by the endothecal spine pattern.

*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 5 mm. Spur formula is 244.

*Male genitalia.* Tergit VIII with deep and wide mesal excision on the apical margin without pronounced lateral lobes. Segment X characterized by elongated head, deep subapical concavity and by straight basal region. Cerci with truncated apex. Harpago tapering long, with slightly downward turning apical region, almost as long as coxopodit. Phallic organ with a large stout spine accompanied by a smaller stout spine and small cluster of small and short spines as well as by some longer and slender spines.

*Etymology.* *hoska*, euphemic coin of “hosszúka” diminutive form of long in Hungarian, refers to the elongated head of segment X compared to its sibling *W. kitera*.



**Figures 13–15.** *Wormaldia hoska* Oláh, sp. nov. Holotype: 13 = male genitalia in left lateral view with additional redrawn lateral profiles of the head of segment X, 14 = mesal excision on tergite VIII and segment X with cerci in dorsal view, 15 = phallic organ with the endothecal spine pattern in left lateral view.

***Wormaldia kera* Oláh, 2019**

(Map 1)

*Material examined.* **Azerbaijan**, Gədəbəy district, Gədəbəy, bushy brook and seep S of the village, N40°27.519' E45°43.114', 1500m, 1.X.2019, leg. T. Kovács, P. Manko & D. Murányi (1 male, OPC).

***Wormaldia khourmai* Schmid, 1959**

(Map 1)

*Material examined.* **Georgia**, Mtskheta-Mtianeti region, Zemo Mleta, brook and seeps along the military road, N42°26.177', E44°29.683', 1565m, 9.VII.2019, leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (2 males, OPC). Georgia, Kvemo Kartli region, Nardevani, open brook and seeps above (S of) the village, N41°32.991' E43°53.232' 1915m, 14.VII.2019, leg. T. Kovács, D. Murányi & G. Vinçon (2 males, OPC).

***Wormaldia kimera* Oláh & Vinçon, sp. nov.**

(Figures 16–18, Map 1, Photos 15–16)

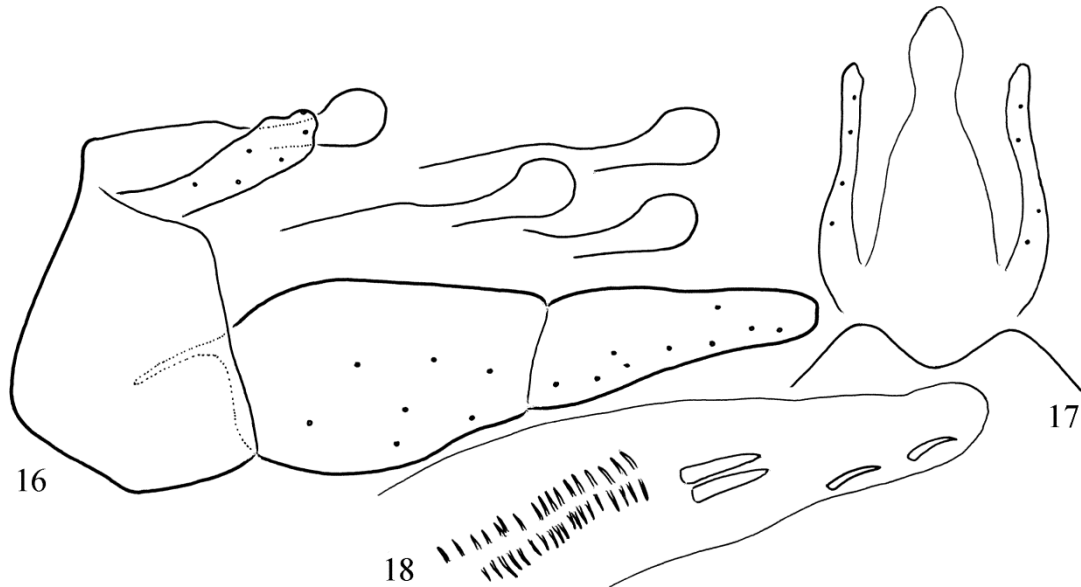
*Material examined.* Holotype: **Georgia**, Kakhetia region, above Lechuri, in direction of Omalo, big torrent above the bridge, tributary of Stori Aragvi River, 42°12'19"N, 45°27'45"E, 880m,

3.X.2019, leg. G. Vinçon (1 male, OPC). Paratype: same as holotype (1 male, OPC).

*Diagnosis.* This new species is distinguished from all the known species by the particular character combination integrated from different lineages. Having tapering harpago it belongs to the *Wormaldia triangulifera* species group, and having four stout spines of the *W. khourmai* species complex. Head of segment X rounded like at *W. daga* from the *W. bulgarica* species complex; the elongated cluster of small spines like at *W. foslana* from the *W. bulgarica* species complex and the four large spines like at species *W. gattolliati* and *W. telva* from the *W. subnigra* species complex.

*Description.* Male (in alcohol). Small castaneous 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 5 mm. Spur formula is 244.

*Male genitalia.* Tergit VIII with deep and wide triangular mesal excision on the apical margin without pronounced lateral lobes. Segment X characterized by slightly elongated circular head, shallow subapical concavity and by straight basal region. Cerci with rounded apex. Harpago tapering long, with slightly downward turning apical region, slightly shorter than coxopodit. Phallic



**Figures 16–18.** *Wormaldia kimera* Oláh & Vinçon, sp. nov. Holotype: 16 = male genitalia in left lateral view with additional redrawn lateral profiles of the head of segment X of holotype and paratype, 17 = mesal excision on tergite VIII and segment X with cerci in dorsal view, 18 = phallic organ with the endothecal spine pattern in left lateral view.

organ with two large equally shaped and two smaller stout spines accompanied by an elongated cluster of small and short spines.

*Etymology.* *kimera*, coined from “chimeric”, composed of different origin in Hungarian, refers to genital structures integrated from various sources.

***Wormaldia kitera* Oláh, sp. nov.**

(Figures 19–21, Map 1, Photo 17)

*Material examined.* Holotype: **Georgia**, Kakheti region, Telavi, Khrukiaskhevi River and its forest sidebrook, N41°53.988', E45°29.243', 775m, 30.IV.2019, leg. T. Kovács, P. Manko & D. Murányi (1 male, OPC).

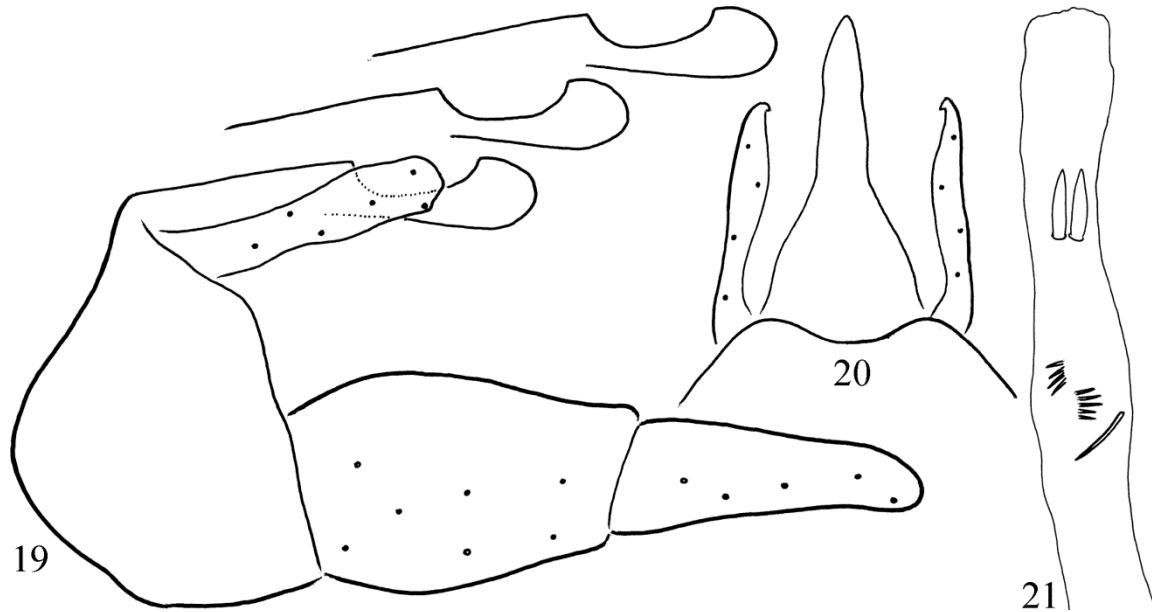
*Diagnosis.* This new species is distinguished from all the known species by the character combination of shorter head of segment X, two equally shaped endothecal stout spines, rounded apex of cerci and the shallow and wide apical excision of tergite VIII. Having tapering harpago it belongs to the *Wormaldia triangulifera* species

group, and having two stout spines of the *W. bulgarica* species complex. Most close to *W. sakaorum* sp. nov., but differs by the short head of segment X and by the pair of stout spines.

*Description.* Male (in alcohol). Small castaneous 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 5 mm. Spur formula is 244.

*Male genitalia.* Tergit VIII with shallow and wide mesal excision on the apical margin without pronounced lateral lobes. Segment X characterized by shorter head, deep subapical concavity and by straight and stretched basal region. Cerci with rounded apex. Harpago tapering, long with slightly downward turning apical region, almost as long as coxopodit. Phallic organ with two large stout equally shaped spines accompanied by small cluster of small and short spines as well as by a single longer and slender spine.

*Etymology.* *kitera*, euphemic coin of “kiterül” stretched in Hungarian, refers to elongated, stretched basal half of segment X.



**Figures 19–21.** *Wormaldia kitera* Oláh, sp. nov. Holotype: 19 = male genitalia in left lateral view with additional redrawn lateral profiles of the head of segment X, 20 = mesal excision on tergite VIII and segment X with cerci in dorsal view, 21 = phallic organ with the endothecal spine pattern in left lateral view.

***Wormaldia kumanskii* Oláh & Chvojka, 2019**

(Map 1)

*Material examined.* **Azerbaijan**, Gədəbəy district, Gədəbəy, open brook and seep S of the village, N40°27.602' E45°43.144', 1480m, 1.X.2019, leg. T. Kovács, P. Manko & D. Murányi (1 male, OPC). **Georgia**, Adjara, Takidzeebi, Shavitketskali Stream, N41°39.516' E42°08.232', 445m, 25.IX.2019, leg. T. Kovács, P. Manko & D. Murányi 4 males, 5 copula, OPC). Georgia, Adjara, open brook N of Goderdzi Pass, N41°39.728' E42°30.315', 2155m, 27.IX.2019, leg. T. Kovács, P. Manko & D. Murányi (1 male, OPC). Georgia, Adjara, steep brook in spruce forest E of Goderdzi Pass, N41°38.000' E42°33.474', 1790 m, 27.IX.2019, leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (18 males, OPC). Georgia, Adjara region, brook and spring, < Goderdzi Pass, Dzindzitskali tributary, N41°37'57" E42°32'38", 1900m, 16.VII.2019, leg. G. Vinçon (1 male, OPC). Adjara region, brook and spring, after Goderdzi Pass, after Beshumi Botanic Garden, Dzindzitskali tributary N41°37'17" E42°32'16", 1970m, 16.VII.2019, leg. G. Vinçon (3 males, OPC). Georgia, Imereti region, steep brook and

spring, north slope of Zekari pass, below Didmaghala Pic, Tsablarastskali tributary, 41°50'55"N, 42°47'43"E, 2080m, 28.IX.2019, leg. G. Vinçon (1 male, OPC). Georgia, Gouria region, brooklet and cascade, tributary of Bzhuzhi River, 41°51'03" N, 42°06'55"E, 660m, 24.IX.2019, leg. G. Vinçon (1 male, OPC). Georgia, Gouria region, spring and brooks with snow, tributary of Bzhuzhi River, below Gomismta, 41°49'57" N, 42°09'21"E, 1910-1980m, 24.IX.2019, leg. G. Vinçon (1 male, OPC). Georgia, Gouria region, brooklet, tributary of Bzhuzhi River, above Gomi, 41°52'25" N, 42°06'19"E, 390m, 24.IX.2019, leg. G. Vinçon (1 male, OPC). Georgia, Kvemo Kartli region, forest brooks and seep along the Tbilisi-Tsalka main road, N41°40.166' E44°19.191', 1495m, 15.VII.2019, leg. P. Manko (3 males, OPC). Georgia, Kvemo Kartli region, Tskhrakudaani, Algeti River above (W of) the village, N41°40.534' E44°22.772', 1010m, 15.VII.2019, leg. P. Manko (5 males, OPC).

*Remarks.* Among the samples there was a single species with character combination of *W. kumanskii*, but the single large stout spines was split into 2 spines of the same size.

***Wormaldia obola* Oláh, sp. nov.**

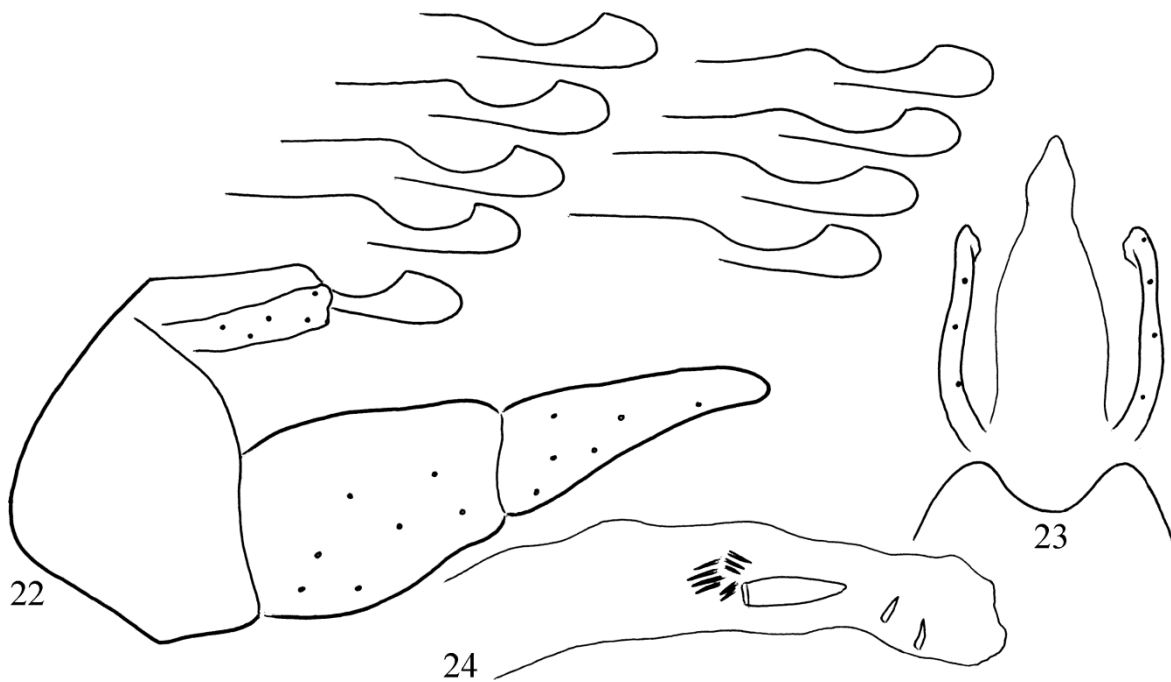
(Figures 22–24, Map 1, Photo 44)

*Material examined.* Holotype: **Azerbaijan**, Gədəbəy district, Gədəbəy, bushy brook and seep S of the village, N40°27.519' E45°43.114', 1500m, 1.X.2019, leg. T. Kovács, P. Manko & D. Murányi (1 male, OPC). Paratypes: same as holotype (4 males, OPC). Azerbaijan, Gədəbəy district, Gədəbəy, open brook and seep S of the village, N40°27.602' E45°43.144', 1480m, 1.X.2019, leg. T. Kovács, P. Manko & D. Murányi (11 males, 2 females, OPC). Azerbaijan, Gədəbəy district, Gədəbəy, forest brook S of the village, N40°27.370' E45°43.123', 1510m, 1.X.2019, leg. T. Kovács, P. Manko & D. Murányi (1 male, OPC). Azerbaijan, Göygöl district, Göygöl N.P., forest brook below Maralgöl Lake, N40°22.855'

E46°18.507', 1875m, 30.IX.2019, leg. T. Kovács, P. Manko, & D. Murányi (7 males, OPC).

*Diagnosis.* This new species is distinguished from all the known species by the particular character combination of truncate cerci, deep subapical concavity on segment X, deep and wide apical excision on tergite VIII, by the particular endothecal spine pattern. One very large and two very small stout spines. Having tapering harpago it belongs to the *Wormaldia triangulifera* species group, and having three stout spines of the *W. khourmai* species complex.

*Description.* Male (in alcohol). Small castaneous 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 5 mm. Spur formula is 244.



**Figures 22–24.** *Wormaldia obola* Oláh, sp. nov. Holotype: 22 = male genitalia in left lateral view with additional redrawn lateral profiles of the head of segment X of holotype and paratypes, 23 = mesal excision on tergite VIII and segment X with cerci in dorsal view, 24 = phallic organ with the endothecal spine pattern in left lateral view.

*Male genitalia.* Tergit VIII with deep and wide mesal excision on the apical margin without pronounced lateral lobes. Segment X characterized by slightly elongated ovoid head, deep subapical concavity and by straight basal region. Cerci with truncated apex. Harpago tapering long, with slightly downward turning apical region, slightly shorter than coxopodit. Phallic organ with one very large and two very smaller stout spines accompanied by a small cluster of small and short spines.

*Etymology.* *obola*, coined from “öböl”, bay, sinus in Hungarian, refers to the deep subapical concavity on segment X.

***Wormaldia sakaorum* Oláh, sp. nov.**

(Figures 25–27, Map 1, Photo 48)

*Material examined.* Holotype: **Azerbaijan**, Şəki district, Kiş, karst spring and brook by Galarsan ruin, N41°15.906' E47°13.631', 1330m, 5.V.2019, leg. T. Kovács, P. Manko & D. Murányi (1 male, OPC). Paratypes: same as holotype (3 males, OPC; 2 males, NMPC).

*Diagnosis.* This new species is distinguished from all the known species by the character combination of elongated head of segment X, single endothecal stout spines, rounded apex of cerci and the shallow and wide apical excision of tergite VIII. Having tapering harpago it belongs to the *Wormaldia triangulifera* species group, and having a single stout spine to the *W. bulgarica* species complex. Most close to *W. kitera* sp. nov., but differs by the longer head of segment X and by the single stout spine.

*Description.* Male (in alcohol). Small castaneous 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 5 mm. Spur formula is 244.

*Male genitalia.* Tergit VIII with shallow and wide mesal excision on the apical margin without

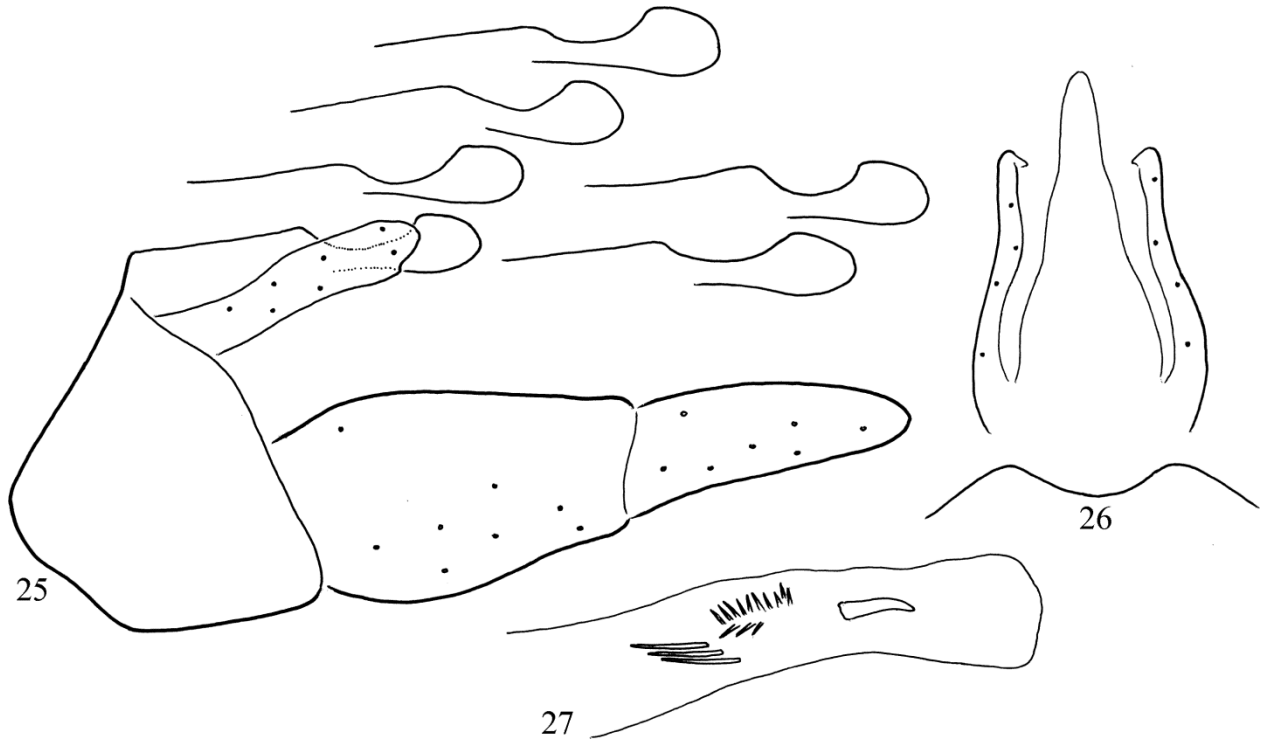
pronounced lateral lobes. Segment X characterized by elongated head, deep subapical concavity and by straight and stretched basal region. Cerci with rounded apex. Harpago tapering long, with slightly downward turning apical region, shorter than coxopodit. Phallic organ with a single large stout spine accompanied by small cluster of small and short spines as well as by a few longer and slender spines.

*Etymology.* The species was named after its type locality and dedicated to the nomadic culture of Sakas. The Saki or Shakai name of the town and the region goes back to the ethnonym of the Sakas, a group of several Iranian ethnic lineages closely related to the Scythian forming together the Scythian culture derived from the Andronovo culture.

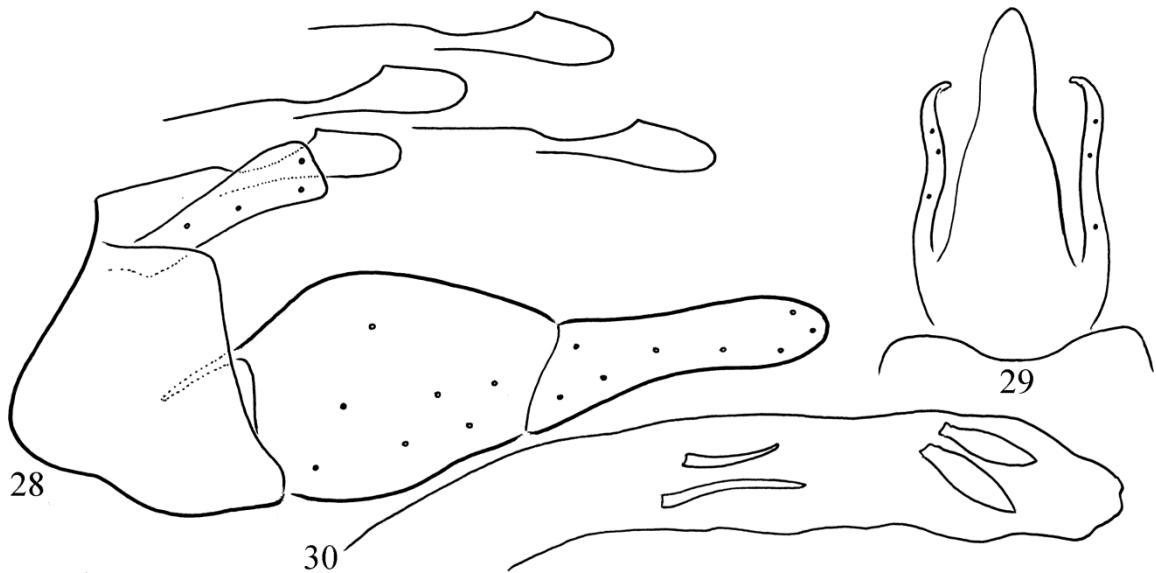
***Wormaldia sima* Oláh & Chvojka, 2019**

(Map 1)

*Material examined.* **Georgia**, Mingrelia and High Svanetia region, Khaishura River tributary, same torrent above Kveda Vedi until its spring, 42°54'47" N, 42°11'05"E, 1300-1500m, 22.IX.2019, leg. G. Vinçon (4 males, OPC). Georgia, Samtskhe-Javakheti region, brooklet in forest with a lot of aquatic vegetation, tributary of Borjomula River, above Bakuriani, 41°43'56"N, 43°30'26"E, 1780m, 29.IX.2019, leg. G. Vinçon (2 males, OPC). Georgia, Mtskheta-Mtianeti region, Tsinamkhari (Mejilauri), forest stream and swampy sidebrook, N42°19.478' E44°38.919', 1180m, 13.VII.2019, leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (2 males, OPC). Georgia, Mtskheta-Mtianeti region, Mejilauri, forest and bushy springs and outlets, N42°19.423' E44°38.732', 1270m, 13.VII.2019, leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (1 male, OPC). Georgia, Mtskheta-Mtianeti region, Zemo Mleta, brook and seeps along the military road N42°26.177' E44°29.683', 1565m, 9.VII.2019, leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (3 males, OPC).



**Figures 25–27.** *Wormaldia sakaorum* Oláh, sp. nov. Holotype: 25 = male genitalia in left lateral view with additional redrawn lateral profiles of the head of segment X of holotype and paratypes, 26 = mesal excision on tergite VIII and segment X with cerci in dorsal view, 27 = phallic organ with the endothecal spine pattern in left lateral view.



**Figures 28–30.** *Wormaldia tomora* Oláh & Vinçon, sp. nov. Holotype: 28 = male genitalia in left lateral view with additional redrawn lateral profiles of the head of segment X, 29 = mesal excision on tergite VIII and segment X with cerci in dorsal view, 30 = phallic organ with the endothecal spine pattern in left lateral view.

***Wormaldia tomora* Oláh & Vinçon, sp. nov.**

(Figures 28–30, Map 1, Photos 29–30)

*Material examined.* Holotype: **Georgia**, Adjara region, brook and spring, Goderdzi Pass, Dzindzitskali tributary, N41°37'57" E42°32'38", 1900m, 16.VII.2019, leg. G. Vinçon (1 male, OPC).

*Diagnosis.* This new species is distinguished from all the known species by the particular character combination of the very truncate cerci, shallow subapical concavity on segment X, very shallow and wide apical excision on tergite VIII, by the particular endothecal spine pattern. Having tapering harpago it belongs to the *Wormaldia triangulifera* species group, and having four stout spines to the *W. khourmai* species complex.

*Description.* Male (in alcohol). Small castaneous 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 5 mm. Spur formula is 244.

*Male genitalia.* Tergit VIII with very shallow and wide mesal excision on the apical margin without lateral lobes. Segment X characterized by very elongated ovoid head, shallow subapical concavity and by straight basal region. Cerci with regularly truncated apex. Harpago less tapering almost parallel-sided, slightly constricted middle, almost as long as coxopodite coxopodit. Phallic organ without cluster of small spines with a pair of similar foliate stout spines as well as with a pair of slender spines, one is longer.

*Etymology.* *tomora*, coined from “tömör”, solid in Hungarian, refers to the solid spines, the cluster of small spines disappeared or solidified.

**Annulipalpia**

**Psychomyioidea superfamily**

**Psychomyiidae Walker, 1852**

***Lype phaeopa* Stephens, 1836**

*Material examined.* **Azerbaijan**, Şəki district, Şəki, Quirxbulaq, karst brook in deciduous forest, N41°08.786' E47°15.532', 595m, 6.V.2019, leg. D. Murányi et al. (1 male, OPC).

***Psychomyia pusilla* Fabricius, 1781**

*Material examined.* **Azerbaijan**, Lankaran region, Lerik district, Talysh Mts, Burkandul, Lankaran River with alder gallery, N38°48.085' E48°31.055', 445m, 22.IX.2018, leg. D. Murányi et al. (12 males, 68 females, OPC). **Georgia**, Kvemo Kartli region, Sakdrioni, Khrami River above Tsalka Reservoir, N41°35.559' E43°56.917', 1520m, 15.VII.2019, leg. T. Kovács, D. Murányi & D. Vinçon (6 males, OPC).

***Psychomyia usitata* McLachlan, 1875**

*Material examined.* **Kazakhstan**, River Ili, 43°55'30"N 76°48'50"E, 700m, 8.VII.2019, leg. Z. Varga (1 males, OPC).

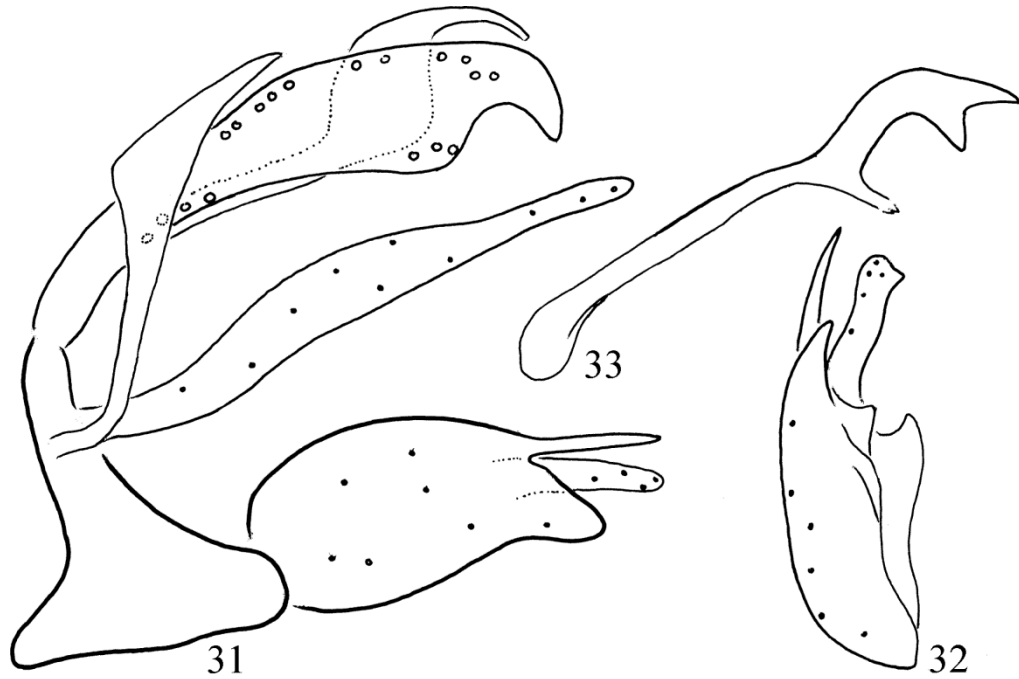
***Tinodes cheitani* Schmid, 1959**

(Figures 31–33)

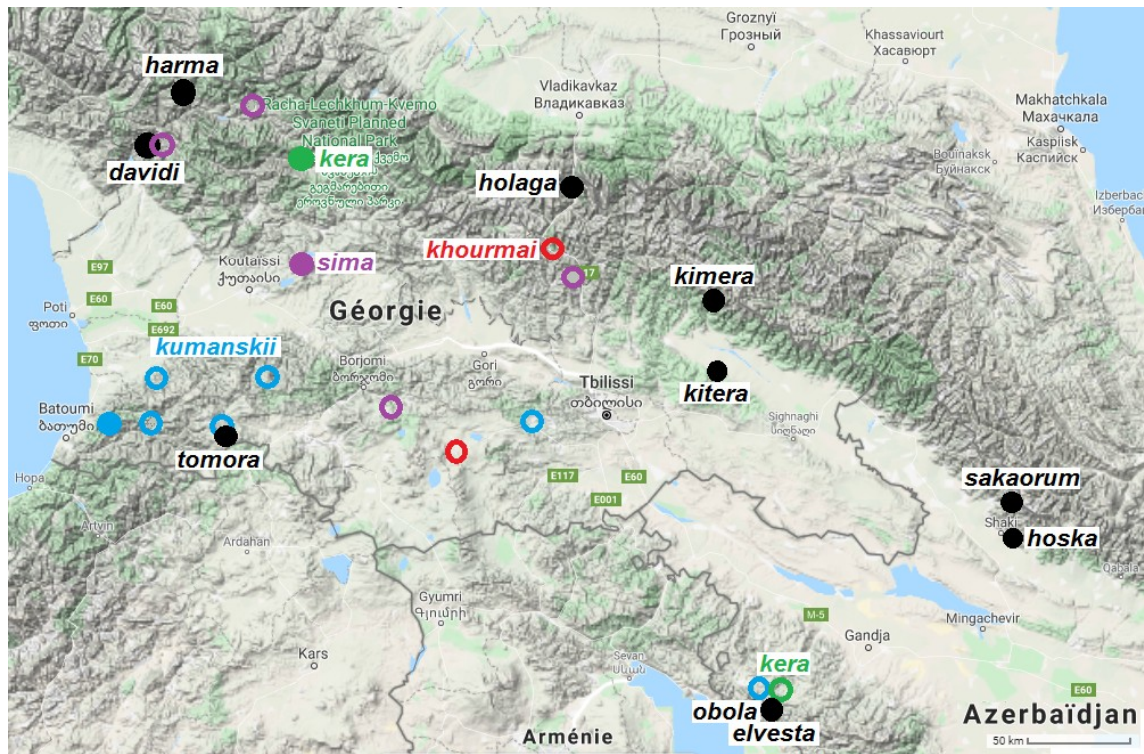
*Material examined.* **Georgia**, Svanetia, brook, left tributary of Mulkhura riv. SE of Mestia, 43°02.5'N, 42°46.3'E, 1510 m, 5.VII.2013, leg. P. Chvojka (3 males, NMPC); the same but 43°02.4'N, 42°45.5'E, 1490 m, 5.VII.2013, leg. P. Chvojka (1 male, NMPC); Svanetia, stream N of Mestia, 43°03.0'N, 42°43.1'E, 1510–1700m, 5.VII.2013, leg. P. Chvojka (36 males, 4 females, NMPC). **Georgia**, Mingrelie and High Svanetia region, Ingouri dam tributary, steep mossy brook, 42°51'31" N, 42°02'01"E, 550m, 22.IX.2019, leg. G. Vinçon (1 male, OPC). **Georgia**, Imereti region, Racha range, Kvemo Krikhi, Krikhula River, N42°29.980', E43°10.541', 610m, 18.IX.2018, leg. D. Murányi et al. (2 males, OPC).

*Remarks.* Genitalia of a specimen from Imereti region is redrawn.





Figures 31–33. *Tinodes cheitani* Schmid, 1959. 31 = male genitalia in left lateral view, 32 = left gonopod in ventral view, 33 = basal plate of gonopode in lateral view.



Map 1. Distribution of *Wormaldia* species (full circles represent the type localities)

***Tinodes difficilis* Martynov, 1927**

*Material examined.* **Georgia**, Adjara, Mtirala NP, Chakvistavi 20 km NE Batumi, brooks, 41°40.6'N, 41°52.4'E, 315 m, 30.VI.2013, leg. P. Chvojka (1 male, NMPC); the same but spring brook, 41°40.7'N, 41°51.8'E, 280 m, 30.VI.2013, leg. P. Chvojka (1 male, NMPC); the same but stream, 41°40.5'N, 41°52.2'E, 320 m, 30.VI.2013, leg. P. Chvojka (2 males, 4 females, NMPC); the same but springs and brooks, 41°40.4'N, 41°51.2'E, 410 m, 1.VII.2013, leg. P. Chvojka (5 males, 8 females, NMPC); Svanetia, stream N of Mestia, 43°03.0'N, 42°43.1'E, 1510-1700 m, 5.VII.2013, leg. P. Chvojka (1 male, NMPC). Mtskheta-Mtianeti region, Gveleti, stream beneath Gveleti Small Waterfall, N42°42.140' E44°37.161', 1630m, 12.VII.2019, leg. T. Kovács, D. Murányi, & G. Vinçon (4 males, OPC).

***Tinodes tichtrya* Schmid, 1959**

*Material examined.* **Azerbaijan**, Lerik, Lenkaran River nr. Piran village, 38°44'10"N, 48°38'05"E, 221 m, 22.IX.2018, leg. J. Oboňa (1 male, NMPC). Azerbaijan, Nakhchivan AR, Ordubad District, Tivi village, river Tivi, sweep netting, N 39° 8'0.24" E 45°55'47.07", 25.VI.2019, leg. I. Kerimova (2 males, OPC).

***Tinodes valvatus* Martynov, 1913**

*Material examined.* **Azerbaijan**, Mamirli waterfall, springs above Ləkit NW of Qax, 41°29'36"N, 46°51'32"E, 610 m, 7.V.2019, leg. D. Murányi & J. Oboňa (2 males, NMPC). **Georgia**, Mtskheta-Mtianeti region, Mejilauri, forest and bushy springs and outlets, N42°19.423' E44°38.732', 1270m, 13.VII.2019, leg. T. Kovács, P. Manko D. Murányi & G. Vinçon (1 male, OPC).

***Tinodes verethraghna* Schmid, 1959**

*Material examined.* **Azerbaijan**, Mamirli waterfall, springs above Ləkit NW of Qax, 41°29'36"N, 46°51'32"E, 610 m, 7.V.2019, leg. D. Murányi & J. Oboňa (3 males, NMPC); small

tributary of Ardavacay River above Qum N Qax, 41°28'10"N, 46°55'57"E, 845 m, 8.V.2019, leg. D. Murányi & J. Oboňa (1 male, NMPC). **Georgia**, Adjara, Mtirala NP, Chakvistavi 20 km NE Batumi, brooks, 41°40.6'N, 41°52.4'E, 315 m, 30.VI.2013, leg. P. Chvojka (5 males, 3 females, NMPC); the same but spring brook, 41°40.7'N, 41°51.8'E, 280 m, 30.VI.2013, leg. P. Chvojka (1 female, NMPC); the same but stream, 41°40.5'N, 41°52.2'E, 320 m, 30.VI.2013, leg. P. Chvojka (3 males, 2 females, NMPC); the same but springs and brooks, 41°40.4'N, 41°51.2'E, 410 m, 1.VII.2013, leg. P. Chvojka (6 males, 9 females, NMPC).

**Polycentropodidae Ulmer, 1903**

***Plectrocnemia conspersa* Curtis, 1934**

*Material examined.* **Kazakhstan**, Kokcy Valley stream, N44°41'03" E78°57'31", 1300m, 2-3.VI.2019, leg. Z. Varga (1 male, OPC).

***Plectrocnemia latissima* Martynov, 1913**

*Material examined.* **Georgia**: Svanetia, brook, left tributary of Mulkhura riv. SE of Mestia, 43°02.4'N, 42°45.5'E, 1490 m, 5.VII.2013, leg. P. Chvojka (1 male, NMPC); Imereti, Nakeral'skii Pereval, tributary of Tkibula River, 42°22'55"N, 43°01'07"E, 1016 m, 18.9.2018, leg. Oboňa (1 male, NMPC). Georgia, Kvemo Kartli region, Aiazmi, Zhamindzori Stream above (S of) the village, N41°33.579' E43°54.282', 1755m, 15.VII.2019, leg. T. Kovács, D. Murányi & G. Vinçon (1 male, OPC).

**Annulipalpia**

**Hydropsychoidea superfamily**

**Hydropsychidae**

***Diplectrona atra* species complex**

This complex is comprised of species with abbreviated internal lobes on segment X. Among the European *Diplectrona* species the members of *D. atra* complex have a pair of shorter setose in-

ternal lobes on segment X compared to the pair of setaless external lobes. The routine identification by this gross morphological character state has formed the basis of species delineation in this complex. However, we have found that both the internal and external lobes have rather wide ranges of variation in the examined population samples. The variation could be real shape and length alterations of genetic origin as well as so called apparent variations. The non-genetic apparent variations are created by functional alterations or deformations during the copulatory processes and by preparatory and observational injuries produced during cleaning and clearing procedures. Due to these sorts of variability most of the determinations including our own published ones are mostly unreliable.

Three species, *Diplectrona atra* McLachlan, from North Italy, *D. vairyra* Schmid from Iran and *D. yazata* Schmid from Turkey are known in this complex. *D. yazata* was described from a single specimen with broken phallic organ, so its taxonomic position is questionable. Therefore, the misidentifications have been scattered between *D. atra* and *D. vairyra*. (See our misidentifications published for *Diplectrona albanica* sp. nov. and *D. serbica* sp. nov.) Until now everybody has collected and determined specimens but set aside as unreliable *atra* or *vairyra* waiting to be revised.

*Species delineation by fine phenomics of phallic apparatus.* The discovery of speciation super trait was particularly productive to delineate closely related phylogenetic incipient sibling species in the Hydropsychidae family (Oláh 2018a,b, Oláh & Jan de Vries 2019). In the hydropsychid *Diplectrona atra* species complex we have found the lateral profile of the entire phallic organ and the lateral profile of the pair of phallotremal sclerites very diverse, stable and reliable to delineate and establish sibling species of the complex. Albeit these stable divergences are delicate, looks tiny for the human eye of limited capacity or negligible for the unsophisticated mental approach they are rather robust on the copulatory level of caddisflies to produce selective signals of stimulatory effects for mate recognition in building the

reproductive isolation (Oláh 2017). To alleviate our human blindness one has to apply the population thinking and examine more specimens in more populations in order to produce diverged trait matrices of several specimens (Oláh et al. 2015). These matrices of speciation traits with many specimens multiply our visual capacity and help our epistemic trials in entity resolutions. It was first shocking to learn how complex genetic network of elaborated quantitative trait loci with hundreds of times thousands of sequence loci with additive small effects are producing minor adaptive shape divergences in directional sexual selection of *Drosophila* species (McNeill et al. 2011).

The curvature divergences of aedeagus almost indiscernible empirically, undetectable reliably by visual experiences, measurable only by geometric morphometry (Franco et al. 2006) involves multitude of quantitative trait loci (Schafer et al. 2011) in protein coding sequences and in gene expression level. Among the detected 8000 genes (rather sequence loci) 2261 genes (rather sequence loci) were differentially expressed between species (Masly et al. 2011)

We have found the following species in the complex: *D. albanica* sp. nov., *D. atra* McLachlan, *D. georgica* sp. nov.; *D. serbica* sp. nov., *D. vairyra* Schmid, *D. yazata* Schmid.

### ***Diplectrona albanica* Oláh, sp. nov.**

(Figures 34–45, Map 2)

*Diplectrona atra* McLachlan, 1878: Oláh 2010:79. “Greece, Lakonia county, Taigetos Mts, Tripi, karst spring in the village, N37° 05.622’ E22° 20.879, 500 m, 4.IV.2009, leg. L. Dányi, J. Kontschán & D. Murányi (2 males, 2 females, HNHM).” Misidentification!

*Diplectrona vairyra* Schmid, 1959: Oláh 2010:79. “Albania, Erseke County, Grammos Mts. 2.8 km E of Starje, valley of Alikolare stream NW of Mt. Qukapeci, N40.361280° E20.754580°, 1864 m, 19.VII.2006, leg. Z. Barina, T. Pifkó & D. Pifkó (3 males, HNHM) Albania, Periferi Tepelene, 7km S of Tepelene, Uji i Ftohte, karstic springs, DK25, N40°15’01.1” E20°03’54.8”, 165m, 12.X.2004, leg. Z. Fehér, J. Kontschán & D. Murányi (2 males HNHM).” Misidentification!

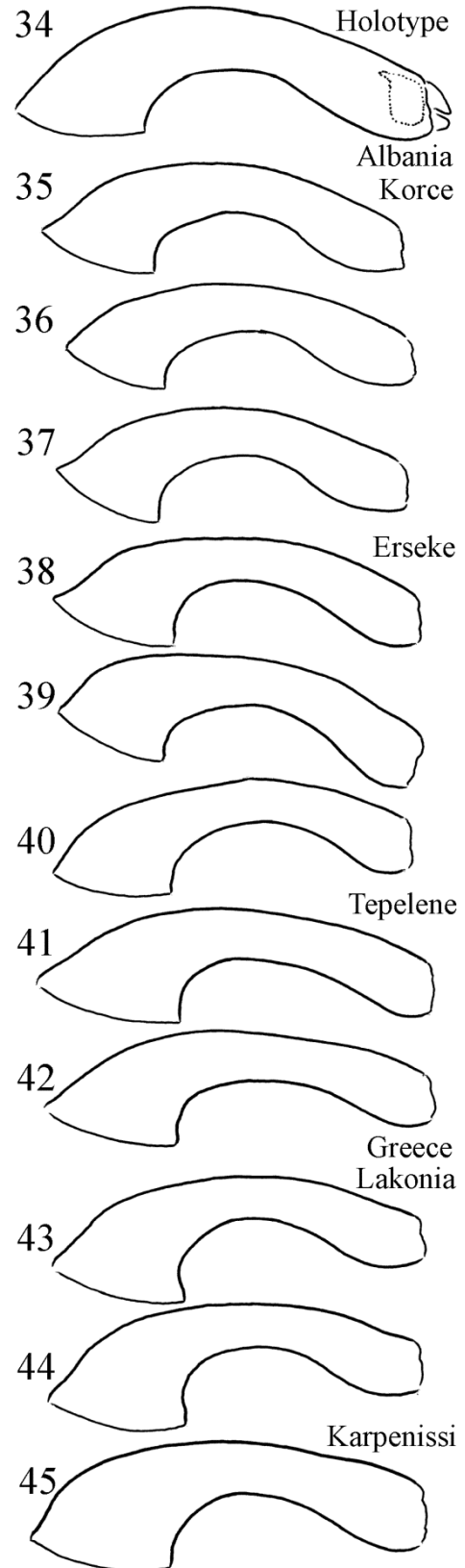
*Diplectrona vairya* Schmid, 1959: Oláh & Kovács 2014:106. "Albania, Sarandë District, Vrinë, shore of river Lumi i Pavllës, N39.71786 E20.02033, 10m, 8.V.2014, leg. Z. Barina, D. Pifkó & G. Puskás (1 male, OPC)." Misidentification!

**Material examined.** Holotype: **Albania**, Sarandë District, Vrinë, shore of river Lumi i Pavllës, N39.71786 E20.02033, 10m, 8.V.2014, leg. Z. Barina, D. Pifkó & G. Puskás (1 male, OPC). Paratypes: Albania, Korçë district, Opari area, Moglicë, torrent in bushy flysh vegetation E of the village, N40°42.387' E20°25.067', 500m, 16.X.2013, leg. P. Juhász, T. Kovács, D. Murányi & G. Puskás (3 males, OPC). Albania, Erseke County, Grammos Mts. 2.8 km E of Starje, valley of Alikolare stream NW of Mt. Qukapeci, N40.361280° E20.754580°, 1864 m, 19.VII.2006, leg. Z. Barina, T. Pifkó & D. Pifkó (3 males, HNHM). Albania, Periferi Tepelene, 7km S of Tepelene, Uji i Ftohte, karstic springs, DK25, N40°15' 01.1" E20°03'54.8", 165m, 12.X.2004, leg. Z. Fehér, J. Kontschán & D. Murányi (2 males HNHM). **Greece**, Lakonia county, Taigetos Mts, Tripi, karst spring in the village, N37° 05.622' E22° 20.879, 500 m, 4.IV.2009, leg. L. Dányi, J. Kontschán & D. Murányi (2 males, 2 females, HNHM). Greece, Karpenissi, N38.751° E21.639°, 1160m, 29.VII.2007, leg. M. Bálint (3 males, OPC).

**Diagnosis.** Having the setose internal lobes on segment X shorter than the setaless external lobes that is the paraplect, it belongs to the *Diplectrona atra* species complex. The lateral profile of the curvature of the phallic organ has resemblance to *D. serbica* sp. nov., but the arch of the ventral margin is more pronounced and S-formed, not straight and J-formed as well as the lateral shape of the phallosclerites are subquadrangular, not triangular.

**Description.** Male (in alcohol). Brown animal. Forewings light brown. Forewing length is 5 mm, apical fork I present on hindwing. Eyes are setaless not enlarged. Maxillary palp formula I-

**Figures 34–45.** *Diplectrona albanica* Oláh, sp. nov. Holotype: 34 = lateral profile of the phallic organ, 35–45 = lateral profile of the phallic organ of paratypes from different populations in Albania and Greece.



IV-III-II-V. Cephalic setose warts on head dorsum represented by two pairs (1) large egg-shaped compact occipital setose warts, (2) vertexal ocellar compact setose warts, as well as by a single (3) vertexal medioantennal compact setose wart; epicranial suture complete, not abbreviated; curves of lateral vertexal grooves rounded subtriangular; ending posterad far from epicranial groove. Anterodorsal filament on sternite V 0.8X as long as the sternite, but after a basal first fifth the fourth fifth length is extremely thin, just discernible; there are two large internal reticulated sacs present both in segment VI and VII.

*Male genitalia.* Segment IX convex anterad, dorsum short and flat with a middle depression line. Segment X fused to the tergum IX. The dorsoapical setose lobes (internal lobes) of segment X well-developed, shorter than setaless external lobes. Cerci setose, high and short in lateral view, semi-circular in dorsal view. Unsetose paraproct (outer lobes or lateral plates of segment X) digitate. Gonopods robust straight and its harpago mesad turning. Phallic apparatus with down curving and broadening basal section and with a longer tube-forming horizontal on two thirds apical section; the lateral profile is characterized by regular arching dorsal and ventral margin; endothecal process movable and variously directed in the examined specimens; phallotremal sclerite large subquadrangular in lateral view.

*Etymology.* *albanica*, named after the country of holotype locality.

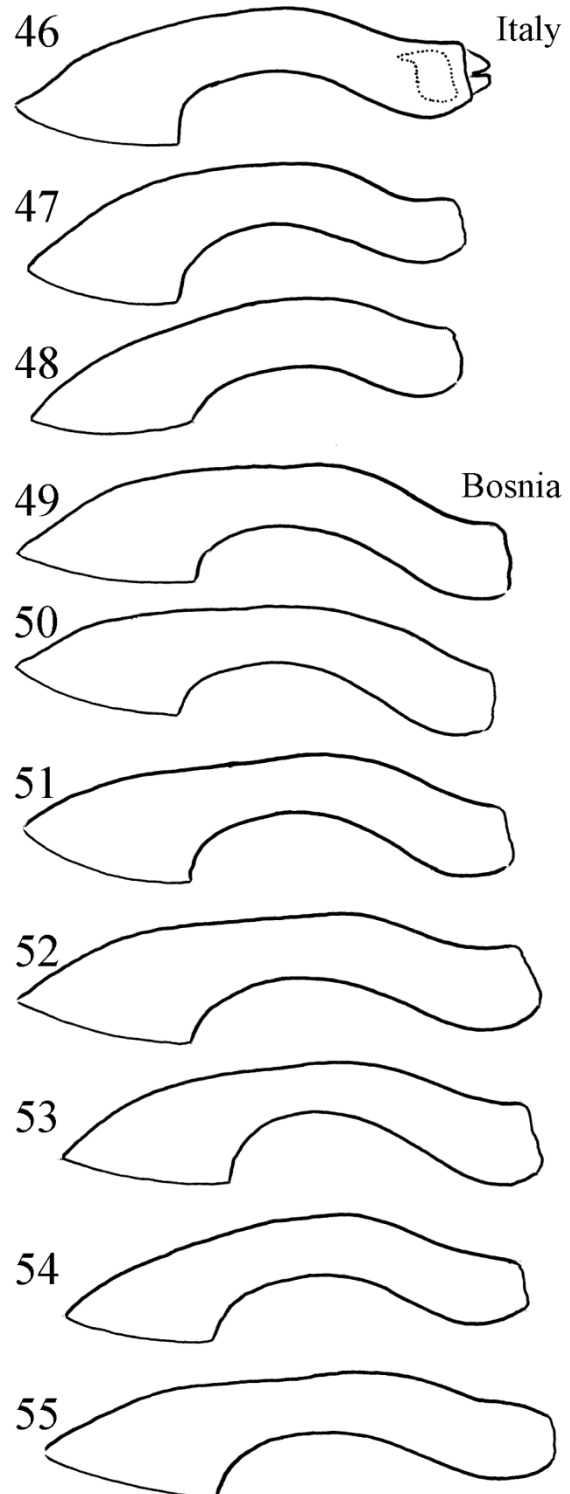
*Remarks.* It is remarkable how stable are the lateral profiles of all specimens in six populations collected at four Albanian and two Greek districts.

***Diplectrone atra* McLachlan, 1878**

(Figures 46–55, Map 2)

*Diplectrone atra* McLachlan, 1878:377. "Tyrol (Bozen, Mann); one pair (♂♀) in Vienna Museum." „This species (which agrees in form with *D. felix*) is very remarkable for its black coloration.”

*Material examined.* **Bosnia-Herzegovina**, Ozre Mts. Goraji Mociocim, Bukovik, N43.93133 E18.44922, 1440m, 12.VII.2008, leg. M. Bálint,



**Figures 46–55.** *Diplectrone atra* McLachlan, 1878. 46–48 = lateral profile of the phallic organ of Italian specimens, from nearby locus typicus, 49–55 = lateral profile of the phallic organ of population from Bosnia–Herzegovina.

S. Lelo & B. Lelo (39 males, 4 females, OPC). **Italy**, Bergamo Province, Lenna, Sorgente Fregera, 500 m, 4.VIII.2010, singled by sweeping net, leg. O. Lodovici & J. Oláh. (1 male, OPC). Italy, Bergamo Province, S. Giovanni Bianco, Roncaglia, hygropetric habitat, 500 m, 4.VIII.2010, singled by sweeping net, leg. O. Lodovici & J. Oláh (1 male, OPC). Italy, Lombardia, Monasterolo Del Castello Bergamo, Val Torezzo Ca' Niverzoli, 500m, 9.VII.2007, leg. M. Bálint, O. Lodovici & M. Valle (2 males, OPC).

*Re-diagnosis.* This dark, almost black animal having the setose internal lobes on segment X shorter than the setaless external lobes that is the paraprot belongs to the *Diplectrone atra* species complex. The lateral profile of the curvature of the phallic organ has resemblance to *D. albanica* sp. nov., but the arch of the dorsal margin is downward directed on its apical third, while the dorsal margin of the lateral profile of the phallic organ is a regular arch in *D. albanica*, without apical downward bending.

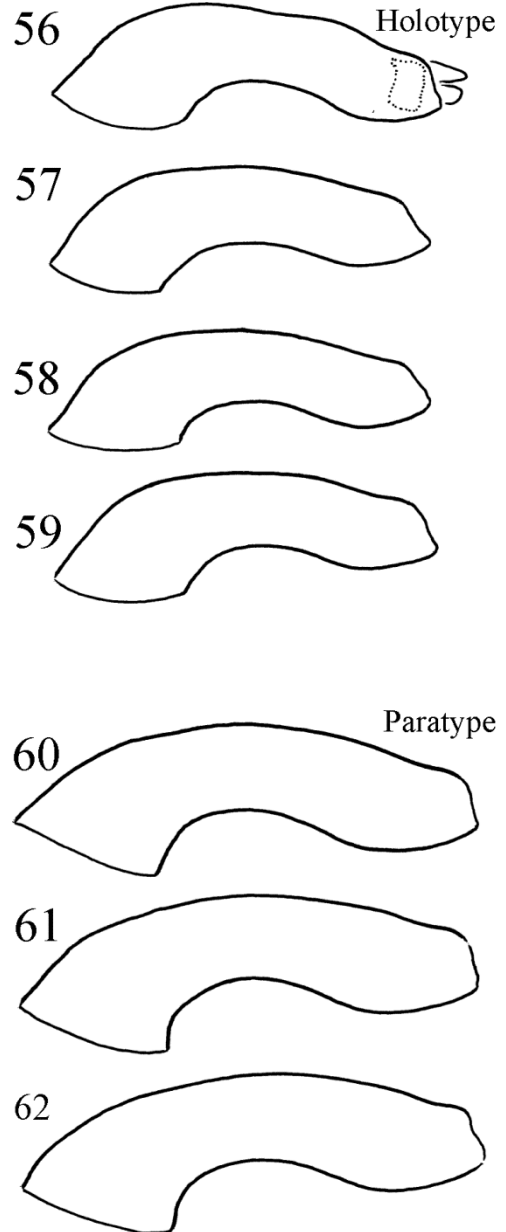
*Remarks.* The apical downward bending in the lateral profile of the phallic organ is very characteristic in both the Italian and the Bosnian populations.

***Diplectrone georgica* Oláh & Vinçon, sp. nov.**

(Figures 56–62, Map 2, Photo 25)

*Material examined.* Holotype: **Georgia**, Adjara, Tsivadzeebi, forest brook along the road, N41°39.939' E42°08.857', 495m, 25.IX.2019, leg. T. Kovács, P. Manko, D. Murányi, & G. Vinçon (1 male, OPC). Paratypes: Georgia, Adjara, Taki-dzeebi, Shavitketskali Stream, N41°39.516' E42°08.232', 445m, 25.IX.2019, leg. T. Kovács, P. Manko & D. Murányi (1 male, 1 female, OPC).

*Diagnosis.* Having the setose internal lobes on segment X shorter than the setaless external lobes that is the paraprot, it belongs to the *Diplectrone atra* species complex. The lateral profile of the curvature of the phallic organ is very abbreviated and very stout compared to all of the other species in the complex.



**Figures 56–62.** *Diplectrone georgica* Oláh & Vinçon sp. nov. Holotype: 56–59 = lateral profile of the phallic organ with additional redrawn lateral profiles, 60–62 = lateral profile of the phallic organ of paratype with additional redrawn lateral profiles.

*Description.* Male (in alcohol). Dark animal. Forewings dark brown. Forewing length is 5 mm, apical fork I present on hindwing. Eyes are setaless not enlarged. Maxillary palp formula I-IV-III-II-V. Cephalic setose warts on head dorsum represented by two pairs (1) large egg-shaped

compact occipital setose warts, (2) vertexal ocellar compact setose warts, as well as by a single (3) vertexal medioantennal compact setose wart; epicranial suture complete, not abbreviated; curves of lateral vertexal grooves rounded subtriangular; ending posterad far from epicranial groove. Anterodorsal filament on sternite V 0.8X as long as the sternite, but after a basal half the apical half is extremely thin, just discernible; there are two large internal reticulated sacs present both in segment VI and VII.

*Male genitalia.* Segment IX convex anterad, dorsum long and flat with a middle depression line. Segment X fused to the tergum IX. The dorsoapical setose lobes (internal lobes) of segment X well-developed, shorter than setaless external lobes. Cerci setose, high and short in lateral view, semi-circular in dorsal view. Unsetose paraproct (outer lobes or lateral plates of segment X) digitate. Gonopods robust straight and its harpago mesad turning. Phallic apparatus abbreviated and stout with down curving and slightly broadening basal section and with a longer tube-forming horizontal on two thirds apical section; the lateral profile is characterized by regular shallow arching dorsal and ventral margin; endothelial process movable and variously directed in the examined specimens; phallosomal sclerite large subquadrangular in lateral view.

*Etymology.* *georgica*, named after the country of holotype locality.

*Remarks.* The lateral profiles of the phallic organs seem stable at the holotype and paratype in spite of the significant size difference between the two specimens.

***Diplectrona serbica* Oláh, sp. nov.**

(Figures 63–66, Map 2)

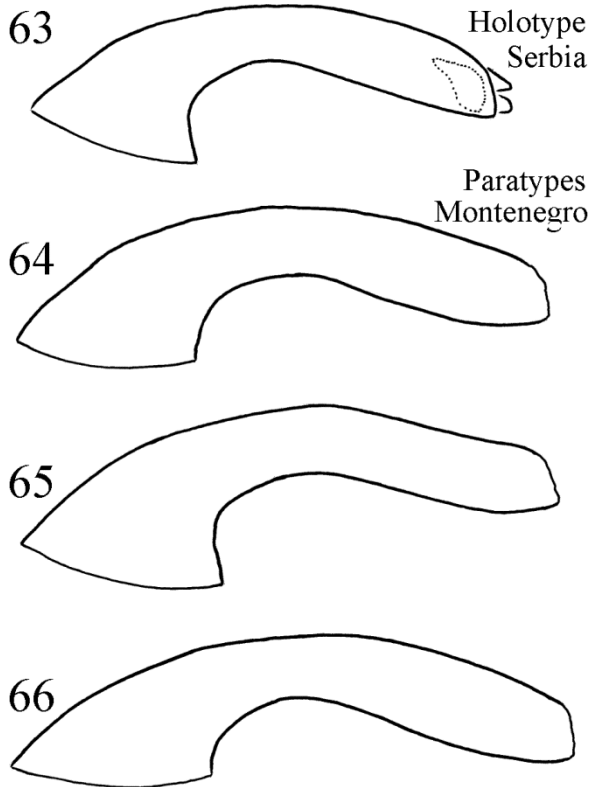
*Diplectrona vairya* Schmid, 1959: Oláh & Kovács 2014:106. "Serbia, Zlatibor district, Zlatibor Mts, spring brook of Crni Rzav Stream beneath Mt. Cigota, N43°37.932', E19°46.305', 1160 m, 13.VI.2012, leg. Z. Fehér, T. Kovács & D. Murányi (1 male, OPC)." Misidentification!

*Material examined.* Holotype: **Serbia**, Zlatibor district, Zlatibor Mts, spring brook of Crni Rzav Stream beneath Mt. Cigota, N43°37.932', E19°46.305', 1160 m, 13.VI.2012, leg. Z. Fehér, T. Kovács & D. Murányi (1 male, OPC). Paratypes: same as holotype (1 female, OPC). **Montenegro**, Bar municipality, Rumija Mts, Sutorman, Basa spring, N42°09'25.6", E19°06'06.3", 770 m, 26.V.2013, leg. P. Juhász, T. Kovács, G. Magos & G. Puskás (3 males, 2 females, OPC).

*Diagnosis.* Having the setose internal lobes on segment X shorter than the setaless external lobes that is the paraproct, it belongs to the *Diplectrona atra* species complex. The lateral profile of the curvature of the phallic organ has resemblance to *D. albanica* sp. nov., but the arch of the ventral margin is less pronounced, almost straight on its apical half and J-formed, not curving and S-formed, as well as the lateral shape of the phallosomal sclerites are triangular, not subquadrangular.

*Description.* Male (in alcohol). Brown animal. Forewings light brown. Forewing length is 7 mm, apical fork I present on hindwing. Eyes are setaless not enlarged. Maxillary palp formula I-IV-III-II-V. Cephalic setose warts on head dorsum represented by two pairs (1) large egg-shaped compact occipital setose warts, (2) vertexal ocellar compact setose warts, as well as by a single (3) vertexal medioantennal compact setose wart; epicranial suture complete, not abbreviated; curves of lateral vertexal grooves rounded subtriangular; ending posterad far from epicranial groove. Anterodorsal filament on sternite V 0.8X as long as the sternite, but after a basal first third the apical two thirds is extremely thin, just discernible; there are two large internal reticulated sacs present both in segment VI and VII.

*Male genitalia.* Segment IX convex anterad, dorsum short and flat with a middle depression line. Segment X fused to the tergum IX. The dorsoapical setose lobes (internal lobes) of segment X well-developed, shorter than setaless external lobes. Cerci setose, high and short in lateral view, semi-circular in dorsal view. Unsetose paraproct (outer lobes or lateral plates of



**Figures 63–66.** *Diplectrona serbica* Oláh sp. nov. Holotype: 63 = lateral profile of the phallic organ, 64–66 = lateral profile of the phallic organ of paratypes from Montenegro.

segment X) digitate. Gonopods robust straight and its harpago mesad turning. Phallic apparatus with down curving and broadening basal section and with a longer tube-forming horizontal on two thirds apical section; the lateral profile is characterized by regular arching dorsal and almost straight ventral apical two thirds; endothelial process movable and variously directed in the examined specimens; phallosomal sclerite large triangular in lateral view.

*Etymology.* *serbica*, named after the country of holotype locality.

*Remarks.* It is remarkable how stable are the lateral profiles of all specimens collected both in Serbia and Montenegro.

***Diplectrona vairyra* Schmid, 1959**

(Figures 67–73, Map 2)

*Diplectrona vairyra* Schmid, 1959:774. Iran: „Holotype ♂: Baharistan (Ost.3) 10.IX.1956; Baharistan (Ost. 3) 20.VIII.1956, 1♂.”

*Material examined.* **Iran**, Talesh Mts. above Bandar Anzali, small tributary of Masula stream, 12.VIII.1990, singled by sweep netting, leg. J. Oláh (22 males, OPC).

*Re-diagnosis.* This brown animal having the setose internal lobes on segment X shorter than the setaless external lobes that is the paraproct belongs to the *Diplectrona atra* species complex. The lateral profile of the curvature of the phallic organ is particularly flat its arching is shallow, even the dorsal margin of the lateral profile is shallow convex, almost straight.

***Diplectrona yazata* Schmid, 1959**

*Diplectrona yazata* Schmid, 1959:798. “Holotype: Merzifoum (Turkey).” „Pénis brisé chez le type”. “Cette espèce est voisine de *atra* et s’en distingue par les branches internes du Xme segment plus courtes.”

*Remarks.* The species description is based on the single holotype with broken phallic organ. The identity has to be examined on specimens with intact phallic organ.

***Cheumatopsyche capitella* Martynov, 1927**

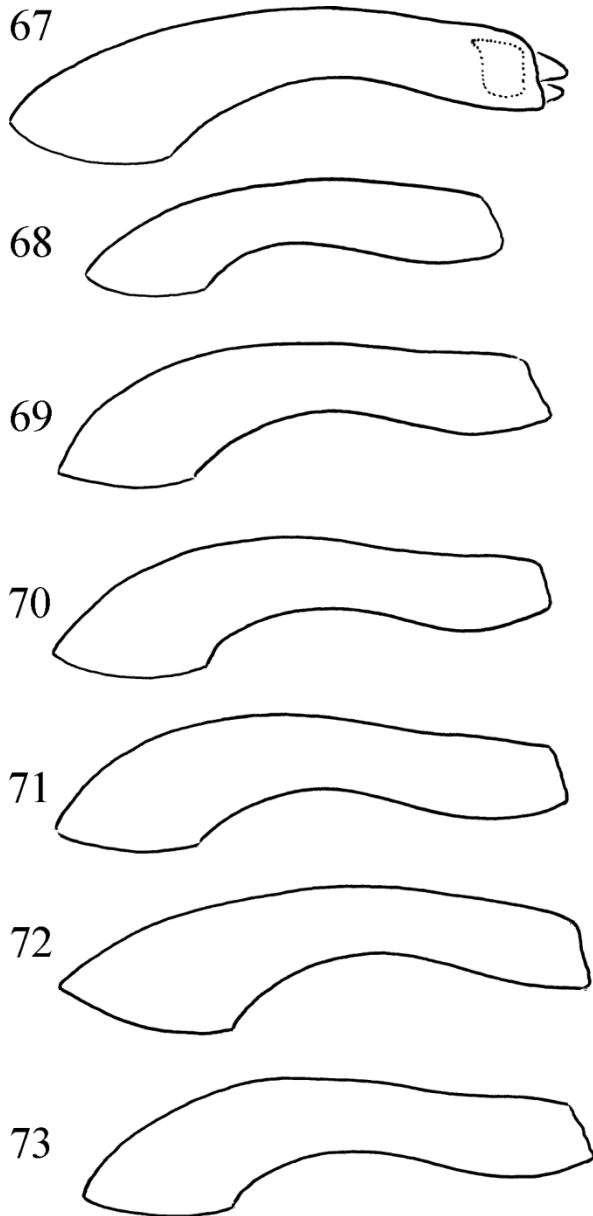
*Material examined.* **Kazakhstan**, Altyn Emel NP, Kordon, 44°06'58"N 78°42'54"E, 894 m, 29.VI.2019, leg. Z. Varga (1 male, OPC).

***Cheumatopsyche lepida* Pictet, 1934**

*Material examined.* **Azerbaijan**, Lankaran region, Lerik district, Talysh Mts, Burkandul, Lankaran River with alder gallery, N38°48.085'



E48°31.055', 445m, 22.IX.2018, leg. D. Murányi et al. (1 male, 61 females, OPC). **Georgia**, Samtskhe-Javakheti region, Paravani River below Saghamo Lake, N41°17.588' E43°43.726', 2015m, 14.VII.2019, leg. T. Kovács, D. Murányi, & G. Vinçon (1 male, OPC).



**Figures 67–73.** *Diplectrona vairyra* Schmid, 1959. 67–73 = lateral profile of the phallic organ of Iranian specimens, from nearby locus typicus.

***Hydronema persica* Martynov, 1914**

(Figures 74–80, Map 3)

*Hydronema* Martynov, 1914:126–127. “I think, that this genus with features of Hydropsychinae Ulm. and Macronematinae Ulm. belongs rather to the first named subfamily.”

*Hydronema persica* Martynov, 1914:126–129. “1♂, 1♀. Pekeli, Tipersai, 28.VII.1907, Zarudny. 1♂, 2♀. Khumsan, 27.VI.1907, Zarudny. (Coll. Zool. Mus. Acad. Sci.)”

*Hydronema persica* Martynov, 1917:16. “In my description of *Hydronema* genus (1914) the species name was given erroneously assuming that the collecting locality is in Persia. In reality the collecting place is in Turkestan and the name is Pekeli, Temirsai and not Pekli, Tipersai.”

*Hydronema persica* Martynov, 1914: Martynov 1934: 294. “Distribution: Turkestan, River Pskem, Temirsai, Khumsan.”

*Hydronema persica* Martynov, 1914: Malicky, 1983: 107. New genital drawings produced without indicating the origin of specimen drawn.

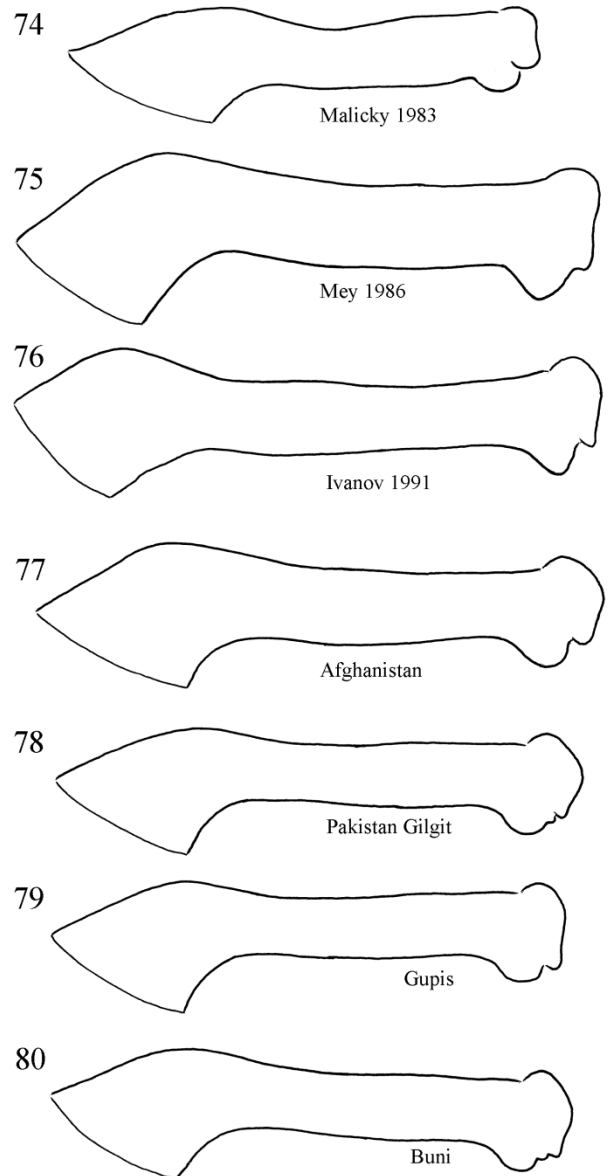
*Hydronema rudolfi* Mey, 1986: 66–67. “Material: Holotypus ♂, (North Tadjhikistan), Hissar-Gebirge, Arg-Fluß, 22.VII.1984, leg. R. Jung.” “Die Gattung *Hydronema* Martynov war bisher ein monotypisches Taxon, dessen einziger Vertreter, *H. persica* Martynov, aus Iran beschrieben wurde. Schmid hat die Art im Iran selbst nicht gefunden (vgl. Schmid, 1959). Die in Afghanistan und Pakistan gesammelten Tiere stellate er auf Grund der Übereinstimmung mit den Martynov’schen Originalabbildungen zu *H. persica*. Eine neue und modern Zeichnung des Genitalapparates von *H. persica*, die auf der Untersuchung eines Syntypus basierte, veröffentlichte Malicky (1983). Ein Vergleich zwischen seinen Abbildungen und dem im Hissar-Gebirge gefundenen Tier liefert jedoch einige deutliche Unterschiede, die nicht als conspezifisch gewertet werden können. Das Exemplar aus dem Hissar-Gebirge wird deshalb als *H. rudolfi* n. sp. beschrieben. Nach Überprüfung des *Hydronema*-Materials, das in Afghanistan und Pakistan gesammelt wurde und sich in coll. Schmid befindet, erwiesen sich alle Tiere ebenfalls als *H. rudolfi* n. sp. Die Art besitzt offensichtlich ein ausgedehntes Areal in den mittelasiatischen Gebirgen. Sie ist die Schwesterart von *H. persica*. Beide können als vikariierendes Artenpaar in der zentralen Südpaläarktis angesehen werden.” Misidentification!

*Hydronema persica* Martynov, 1914: Ivanov 1991: 5. "The additional data on the Zarudny expedition (type localities) given in parentheses were found in the letter of L. Lindknecht to E. Tetujeva, deposited in the files of the Zoological Institute in Leningrad." "Lectotype male: (West Tian-Shan, Talas Alatau Mts., river Ugam) Khumsan, 27.VI.1907 (new Gregorian date: 10.VII.1907), Zarudny." "Differences between both species, *H. persica* and *H. rudolfi*, were so small that one might suspect the synonymy of these two species." "Genitalia of *H. persica* were studied and illustrated by Malicky (1983) as having wide basal segments of the inferior appendages with roughly serrated dorsal surfaces, and rounded apical segments of these appendages. Genitalia of the syntype specimen studied by Malicky were treated in KHO and were slightly damaged during this treatment: the swelling matrix within the basal segment of the inferior appendages broke the thin cuticle on the dorsal surface of the gonopods, and the broken edges directed upwards were illustrated as being the dorsal surface of the gonopods. Unfortunately, this drawing was the only material for comparison with *H. rudolfi*."

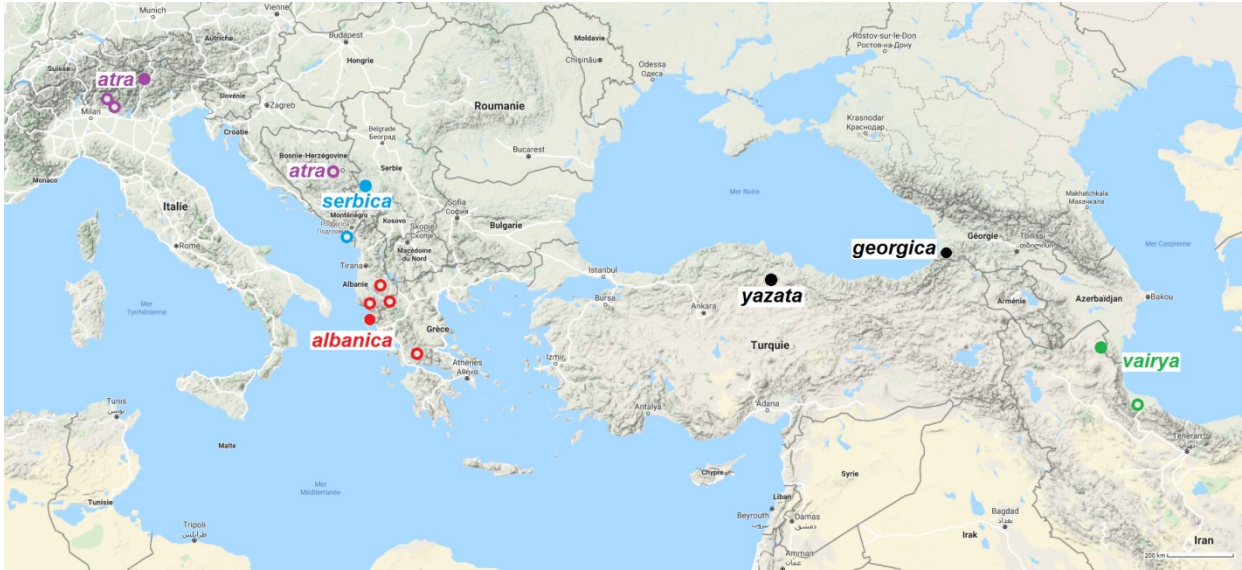
**Material examined.** **Afghanistan**, North, Nuristan, Bashgultal, 1150 m, 12.V.1953, leg. J. Klapperich (2 males, OPC). **Pakistan**, Gilgit, 1700 m, 29.V.1992, light leg. Csorba & Hreblay (1 male, OPC). Pakistan, Gupis, 2000 m, 20.VI.1992, light leg. Csorba & Hreblay (1 male, OPC). Pakistan, Buni (Booni), 2200 m, 23.VI.1992, light leg. Csorba & Hreblay (54 males, 5 females, OPC).

**Remarks.** *Hydronema* genus is a typical chimeric taxon composed of and mixed the character states of two subfamilies Hydropsychinae and Macronematinae. According to the published drawings as well as examining and drawing of new specimens from various localities it seems that *Hydronema persica* is a rather stable species on the wide distributional area covering recent countries of historic Turkestan: North Afghanistan, Kyrgyzstan, North Pakistan, Tajikistan, and Uzbekistan. The description *H. rudolfi* Mey, 1986 was based on the erroneous Malicky's drawing with swollen distal half of the coxopodite. The lateral profile of the speciation trait that is the phallic organ seems very stable on the

entire distributional area without pronounced variation. The apparent pattern variation on the head of the phallic organ is created by the functionally altering actual position of the pairs of the movable endothelial and phallosomal sclerites.



**Figures 74–80.** *Hydronema persica* Martynov, 1914. 74–80 = lateral profiles of the phallic organ from published drawings and from newly collected specimens in Afghanistan and Pakistan.



Map 2. Distribution of *Diplectrona* species (full circles represent the type localities)

***Hydronema turkestanica* Oláh, sp. nov.**

(Figures 81–84, Map 3)

**Material examined.** Holotype: **Kazakhstan**, Almaty Region, Charyn National Park, Headquarter, 43°14'16"N 78°48'47"E, 1345m, 22.VI. 2019, leg. Z. Varga (1 male, OPC). Paratypes: same as holotype (4 females, OPC).

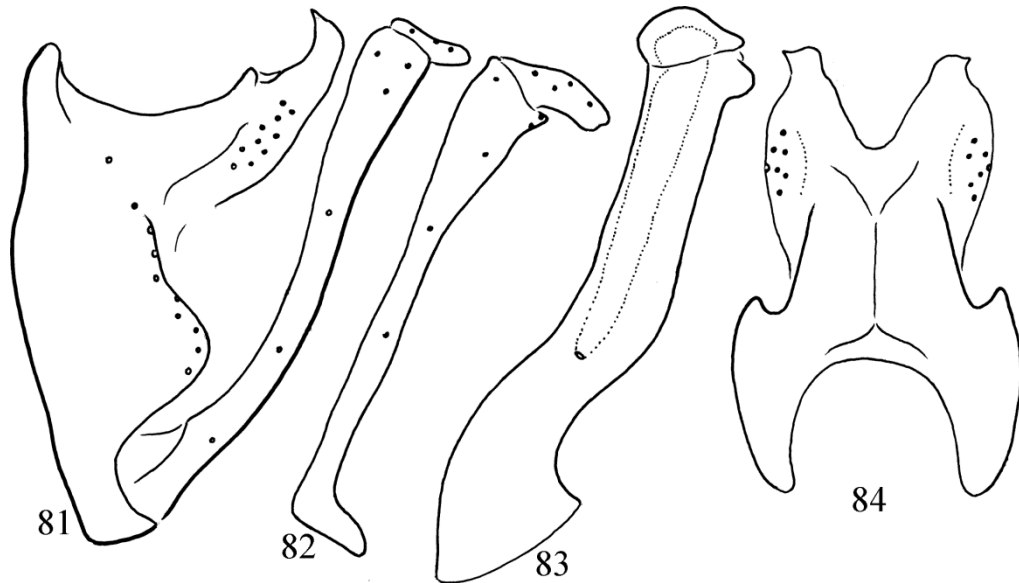
**Diagnosis.** Body characters are similar to its ancestral relative, *Hydronema persica* with distinct modification in the apical structure of segment X and in the lateral profile of the phallic organ. Apices of segment X diverged into a short laterad directed small pointed spiny structure, not blunt and not mesad turning. The basal half of the phallic organ is clearly arching subbasad, not straight.

**Description.** Male (in alcohol). Medium sized animal. Head and thoracic sclerites dark brown, the vestigial maxillary and labial palps as well as the legs are yellow. Forewings light brown. Forewing length 9 mm. Spur formula is 133. Body characters are typical chimeric composed of and mixed by components from the Hydropsychinae and Macronematinae subfamilies. Basically, hydropsychine habitus with several mac-

ronematine characters: reduced maxillary and labial palps, thin and long antennae, reduced wing setae, reduced discoidal cell on wings.

**Male genitalia.** Segment IX is almost straight vertical anterad with blunt triangular lobe posterad. Segment X elongated bilobed with characteristic laterad turning small pointed spiny process. Cerci present laterad on segment X as elongated setose slightly elevated area. The coxopodite of gonopods reaches not longer than the tip of segment X; harpagones turning mesad with truncate apices as visible in ventral view. Lateral profile of the phallic organ with particular basal arching.

**Etymology.** *turkestanica*, the name of this new species discovered in Kazakhstan refers to Turkestan, „Land of the Turks”, a historical region in Central Asia including recent „stan” countries (Iranian prefix of land or country) of Kazakhstan, Kyrgyzstan, Tajikistan, Turkmenistan, Uyghuristan (China), and Uzbekistan, and parts of northern Afghanistan and northern Pakistan. With this name, we intend to remind the erroneous name of *Hydronema persica*, the type species of this monobasic genus that was never collected in Iran, but described from western Kyrgyzstan and recorded from several countries of the lands of Turks.



**Figures 81–84.** *Hydronema turkestanica* Oláh, sp. nov. Holotype: 81 = male genitalia in left lateral view, 82 = left gonopod in ventral view, 83 = phallic organ in lateral view, 84 = segment IX and X in dorsal view.

#### *Hydropsyche newae* species group

The species in this group is characterized by having highly sinuate phallotheca; genital opening localised on the dorsal side; the apex of phallotheca extends beyond phallotremal sclerites, partially membranous and with spicules or with membranous lobes. The species has phallotheca with membranous subapical dorsum and a modified endotheca surmounted by a pair of more or less fused heavily pigmented dark ball-like phallotremal sclerites. A pair of long membranous endothelial processes arising just behind the dominating phallotremal sclerites. The apex of the endothelial process has sclerous tip, spicule, or spine, sometimes replaced by rounded membranous spinose window in various positions, with sclerous point, spicule or spine. The lower ventral and apical portion of endotheca is fused with the apex of the phallotheca (enlarged phallobase). Three apicoventral lobules of endotheca are surrounded by, and embedded in a sclerous integumentum, each lobule is membranous and to some extent eversible, and tipped with a cluster of pale sclerous spicules; these lobules are sometimes fused into one or two large lobule inverted deeply into the sclerous apical portion of the endotheca (Oláh & Johanson, 2008).

#### *Hydropsyche newae* lineage

The downcurving basal section of phallotheca more or less right or obtuse angled rather enlarged. The longer terminal section is mostly horizontal or waved (Oláh & Johanson, 2008).

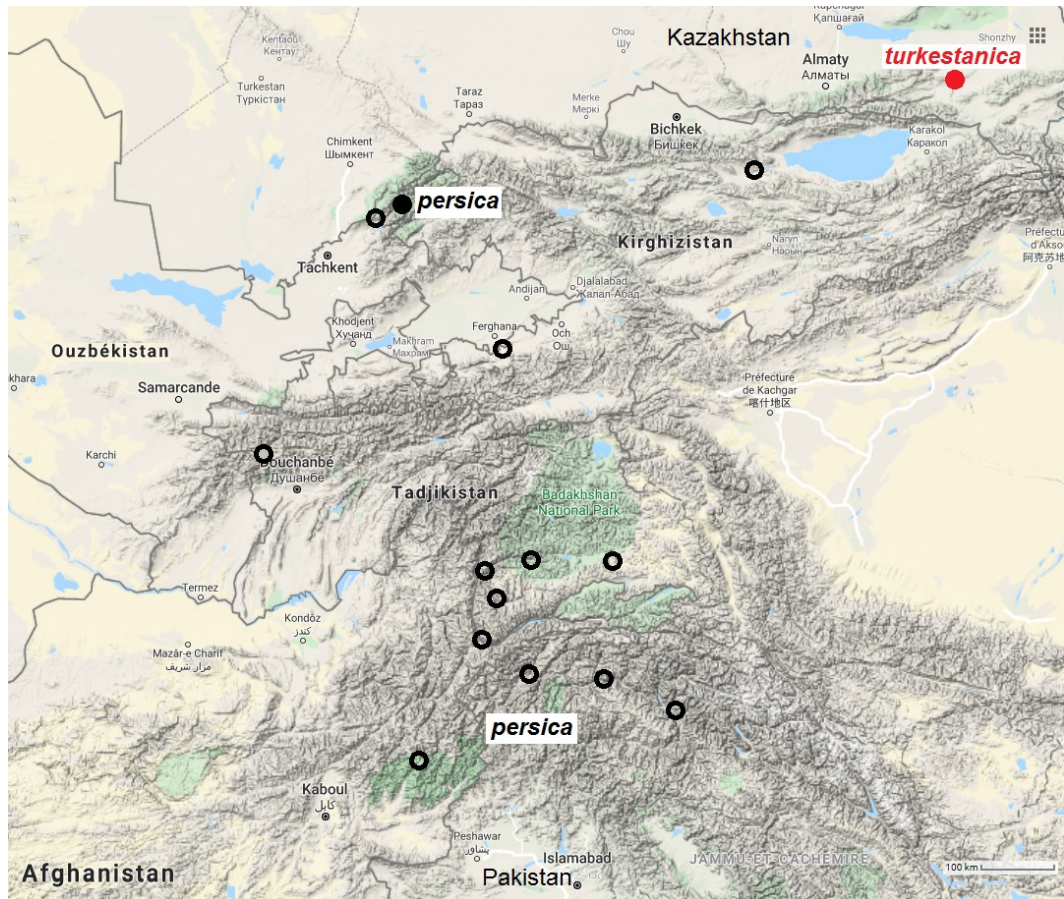
#### *Hydropsyche kozhantschikovi* Martynov, 1924

(Map 5)

*Material examined.* **Kazakhstan**, River Ili, 43°55'30"N 76°48'50"E, 700m, 8.VII.2019, leg. Z. Varga (1 male, OPC).

#### *Hydropsyche angustipennis* species group

Species in this group are widely distributed in Palearctic and Nearctic biogeographic regions and are characterized by phallothecal apex with well sclerotized structural elements of the endothelial processes and of the highly complex phallotremal sclerites. The sclerotized endothelial process is immovable, that is fused to the phallothecal apex (Oláh & Johanson, 2008). *H. angustipennis* species group is comprised of three lineages: *H. guttata*, *H. pellucidula* and *H. instabilis*.



Map 3. Distribution of *Hydonema* species (full circles represent the type localities)



Map 4. Distribution of *Hydropsyche* species (full circles represent the type localities)

### ***Hydropsyche guttata* lineage**

*Hydropsyche guttata* lineage in the *H. angustipennis* species group is characterized with sclerotized endothelial process fused to the apical end of the phallosome, without digitiform ventroapical setose lobe and without angular subapical lateral projections before the cleft apex of the phallosome (Oláh & Johanson 2008).

Based upon the curvature shape in the lateral profile of the phallic apparatus we have distinguished two clades in the *H. guttata* lineage: the *H. angustipennis* clade having deep curvature and the *H. modesta* clade having shallow curvature. This distinction with the speciation trait of the phallic organ seems like the most adequate trial to select a reliable character tree for lineage sorting. Due to the chimeric nature of entities resulted by trait reticulation there are almost infinite number of character trees in most of the species trees (Oláh et al. 2019a). The tree of the adaptive, non-neutral speciation trait of the phallic organ may offer the most probable basis to classify divergences. The general that is the older trait like deep or shallow curvature shape may indicate older divergence and the more diverse and more specified pattern of phallic head may indicate contemporary splits of incipient species.

### ***Hydropsyche angustipennis* clade**

#### ***Hydropsyche iranica* Malicky, 1977**

(Map 4)

*Material examined.* **Azerbaijan**, Shabran District, Liman Akzybir, N41°17'15.37", E49°4'28.89", -28m, 19.VII.2019, sweep netting, leg. I. Kerimova (1 male, OPC). **Azerbaijan**, Nakhchivan, Cahri, 8–9.V.1955, leg. A. Zaguljajev (3 males, OPC). **Georgia**, Gouria region, River Supsa, crossroad SW Nagomari in direction of Kvemo Aketi, 41°59'53" N, 42°05'42"E, 73m, 24.IX.2019, leg. G. Vinçon (2 males, OPC). **Georgia**, Tbilisi, 8.VII.1983, leg. E. Ács (2 males, OPC). **Iran**, Talesh Mts. above Bandar Anzali, small tributary of Pasikhan River, 1.IX.1990, light, leg. J. Oláh (1 male, OPC). **Turkey**, vill.

Erzincan Ganiefendi, Ciflik Köyü, 1200m, 27–28.VI.1996, leg Podlussány (2 males, HNHM).

### ***Hydropsyche ornatula* McLachlan, 1878**

(Map 4)

*Material examined.* **Azerbaijan**, Shabran District, Liman Akzybir, N41°17'15.37", E49°4'28.89", -28m, 19.VII.2019, sweep netting, leg. I. Kerimova (1 male, OPC).

### ***Hydropsyche harmada* Oláh, sp. nov.**

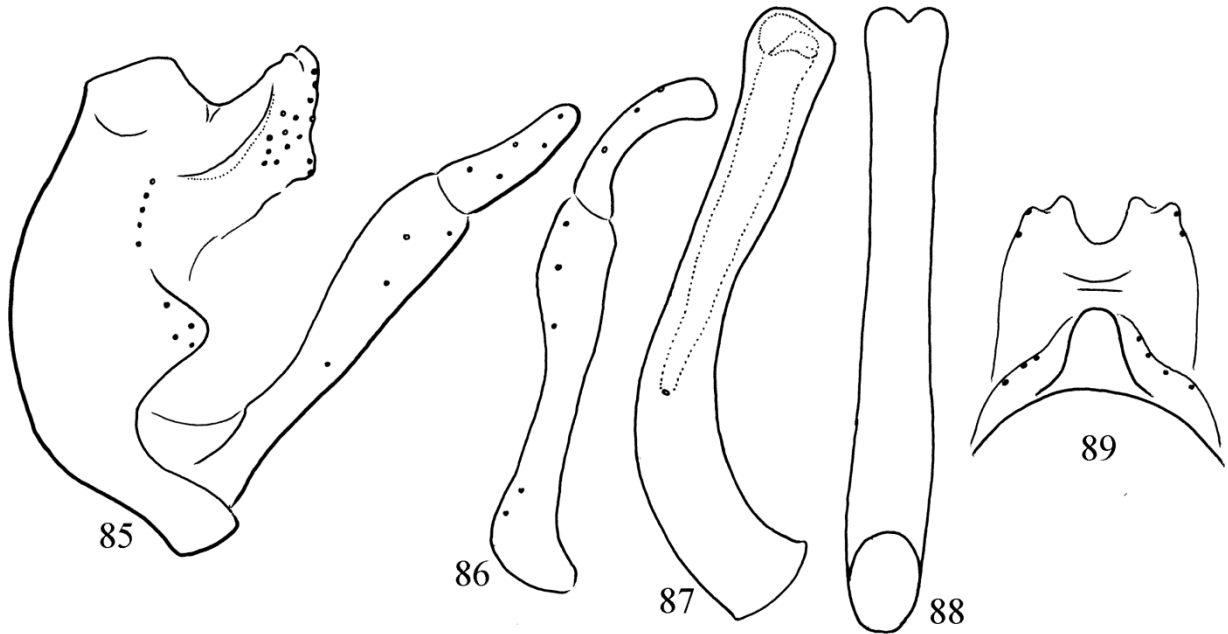
(Figures 85–89, Map 4)

*Material examined.* Holotype: **Iran**, Khorramabad a., Kaspischen M., 30.VIII.1961, leg. J. Klapperich (1 male, OPC).

*Diagnosis.* This single male specimen represents a new taxon in the *H. guttata* lineage. Most close to *Hydropsyche contubernalis*, but differs by having the downward curving basal region of the phallosome abbreviated around only one third of the total length, not around one half; moreover, the apex of the phallosome diverging laterad not converging mesad.

*Description.* Male. Cephalic and thoracic sclerites are brown. Wings light brown, without pronounced pattern. Maxillary palp formula I-III-II-IV-V. Spur formula 244. Forewing length 7 mm.

*Male genitalia.* Segment IX fused annular and short; its median keel short and broad, rounded parallel-sided with granulose dorsal surface; apical lobe on posterolateral margin rounded triangular, anterior margin convex. Intersegmental profile between the ninth and tenth segments wide and deep triangular. Segment X trapezoid in lateral view, quadrangular in dorsal view; lateral setose area, the cerci fused with ventroapical setose lobe, located in posterad position; dorsoapical setose lobes reduced to the setose anterior area of the unsetose dorsolateral rim of segment X in lateral view. The coxopodit of the gonopod slightly longer than the apex of segment X; harpago with capitate apex in ventral view. Lateral profil of the phallic organ with short but



**Figures 85–89.** *Hydropsyche harmada* Oláh, sp. nov. Holotype: 85 = male genitalia in left lateral view, 86 = left gonopod in ventral view, 87 = phallic organ in lateral view, 88 = phallic organ in ventral view, 89 = segment IX and X in dorsal view.

deep curving basal region, apex diverging laterad in ventral view.

*Etymology.* *harmada*, coined from “harmad”, third in Hungarian, refers to the abbreviated downward curving basal region of the phallosome that is abbreviated around only one third of the total length.

#### *Hydropsyche modesta* clade

##### *Hydropsyche carbonaria* McLachlan, 1875

(Map 5)

*Material examined.* **Kazakhstan**, Almaty Region, Charyn National Park, Headquarter, 43°14'16"N 78°48'47"E, 1345m, 22.VI.2019, leg. Z. Varga (5 males, 2 females, OPC). **Kazakhstan**, Almaty Region, Charyn National Park, “badland”, 30 km from Headquarter, 43°12'44"N 78°45'53"E, 1382m, 23.VI.2019, leg. Z. Varga (4 males, 1 female, OPC). **Kazakhstan**, Altyn Emel NP, Kordon, 44°06'58"N 78°42'54"E, 894 m, 29.VI.2019, leg. Z. Varga (2 males, OPC).

##### *Hydropsyche integrata* Mey, 1981

(Map 5)

*Hydropsyche integrata* Mey, 1981:60–61. “Holotypus ♂: Agalyk, 18.VII.1979; 18 ♂ Paratypen vom selben Ort, Tschatkalski Chrebet, Kumyschkan, 21.VII.1979, 4 ♂.” “Die Art ist der *H. demavenda* nahestehend, unterscheidet sich aber von ihr durch die andere Form des 10. Segments. Dieses ist andererseits ähnlich strukturiert wie das von *H. carbonaria* McL. Die von Martynov (1914, 1927) als *H. exocellata* Duf. bestimmten Tiere beziehen sich sicherlich auch auf *H. integrata* n. sp. (siehe auch Malicky 1977).”

*Material examined.* Paratypes: **Uzbekistan**, Agalyk, Samarkand, 18.VII.1979, leg. R Jung & A. Müller (2 paratypes, OPC; presented by Mey, ZMB). **Kazakhstan**, Almaty Region, Charyn National Park, “badland”, 30 km from Headquarter, 43°12'44"N 78°45'53"E, 1382m, 23.VI.2019, leg. Z. Varga (1 male, OPC). **Kazakhstan**, Altyn Emel NP, Kordon, 894 m, 29.VI.2019, leg. Z. Varga (2 males, OPC).



Map 5. Distribution of *Hydropsyche* species, related eastern region (full circles represent the type localities)

***Hydropsyche modesta* Navas, 1925**

(Map 4)

*Material examined.* **Turkey**, Denizli country, 2 km W of Pamukkale, 8.X.1980, leg. L. Peregovits (1 male, OPC).

***Hydropsyche rovnaka* Oláh, sp. nov.**

(Figures 90–94, Map 5)

*Material examined.* Holotype: **Uzbekistan**, Western Tien-Shan, Ugam-Chatkal National Park, Chatkal-Kizil-Say, Northeast of Taskent 28.V.–3.VI.1982, leg. L. Peregovits (1 male, OPC).

*Diagnosis.* This single male specimen represents a new taxon in the *H. guttata* lineage. Most close to *Hydropsyche integrata*, but differs by having much longer dorsal keel on segment IX; as well as the apex of the phallotheca short with short neck.

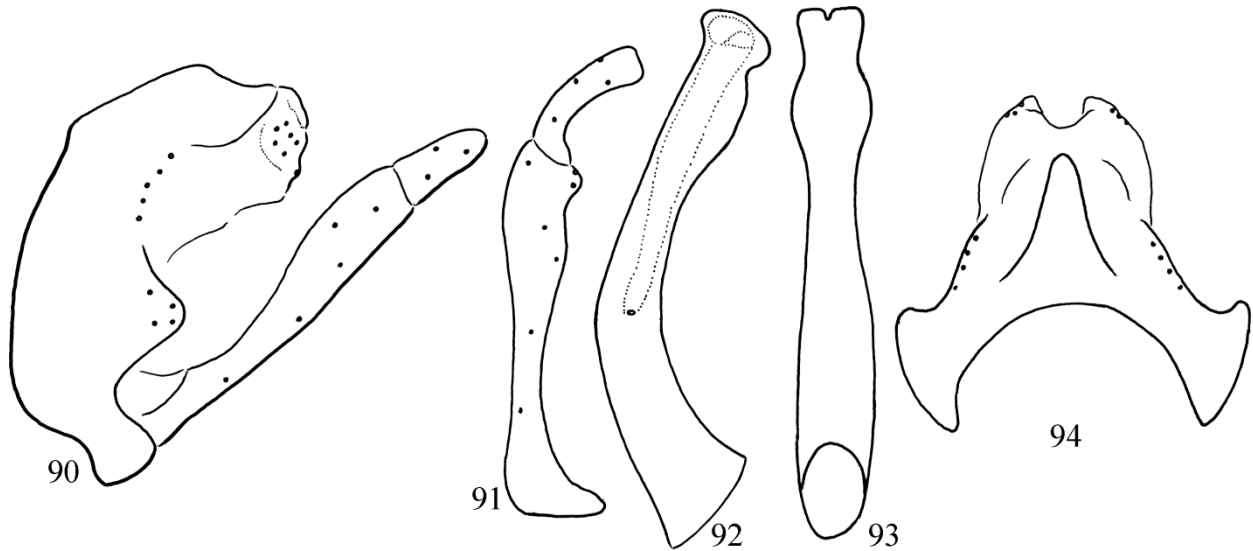
*Description.* Male. Cephalic and thoracic sclerites are brown. Wings light brown, without pronounced pattern. Maxillary palp formula I-III-

II-IV-V. Spur formula 244. Forewing length 9 mm.

*Male genitalia.* Segment IX fused annular and short; its median keel elongated and tapering apicad with granulose dorsal surface; apical lobe on posterolateral margin rounded triangular, anterior margin convex. Intersegmental profile between the ninth and tenth segments wide open. Segment X short in lateral view, subquadrangular in dorsal view; lateral setose area, the cerci fused with ventroapical setose lobe, located in posterad position; dorsoapical setose lobes reduced to the setose anterior area of the unsetose dorsolateral rim of segment X in lateral view. The coxopodit of the gonopod slightly longer than the apex of segment X; harpago with capitat, truncate apex in ventral view. Lateral profil of the phallic organ intermediate having curving basal region between deep and shallow, apex with short neck clearly visible and pronounced both in lateral and ventral view.

*Etymology.* *rovnaka*, coined from “rövid nyak”, short-necked in Hungarian, refers to the abbreviated downward curving basal region of the phallotheca.





**Figures 90–94.** *Hydropsyche rovnaka* Oláh, sp. nov. Holotype: 90 = male genitalia in left lateral view, 91 = left gonopod in ventral view, 92 = phallic organ in lateral view, 93 = phallic organ in ventral view, 94 = segment IX and X in dorsal view.

***Hydropsyche sakarawaka* Schmid, 1959**

(Map 4)

*Material examined.* **Azerbaijan**, Goygol District, Togana village, river Kurekchay, N40°25' 32.30" E46°18'54.05", 1244m, 24.VII.2019, on light trap, leg. I. Kerimova (13 males, OPC).

***Hydropsyche sciligra* Malicky, 1977**

(Map 4)

*Material examined.* **Armenia**, Tavush Province, Idzevan, 1500 m, 23.IX.1983, light leg. Z. Varga (57 males, OPC); 20 males presented to MPC). **Armenia**, Eriwan, 29.VI.1929, leg. A. Schelkovnikov (3 males, OPC). **Azerbaijan**, Lenkoran, 2.VII.1931, leg. A.A. Varschalovits (1 male, OPC). **Azerbaijan**, Guba District, Afurdja village, N41°08'19,7" E048°37'11,3", 1157m, 8-12.VII.2019, on light trap, leg. I. Kerimova (2 males, OPC). **Azerbaijan**, Shabran District, Liman Akzybir, N41°17'15.37", E49° 4'28.89", -28,96 m, 19.VII.2019, sweep netting, leg. I. Kerimova (1 male, OPC). **Georgia**, Tbilisi, 8.VII.1983, leg. E. Ács (4 males, OPC). **Iran**, Talesh Mts. above Bandar Anzali, small tributary of Masula stream,

12.VIII.1990, light, leg. J. Oláh (1 male, OPC). **Iran**, Talesh Mts. above Bandar Anzali, small tributary of Pasikhan River, 1.IX.1990, light, leg. J. Oláh (1 male, OPC). **Russia**, Dagestan, Derbent, 29.VI.1931, leg Rjabov (1 male, OPC).

***Hydropsyche speciophila* Mey, 1981**

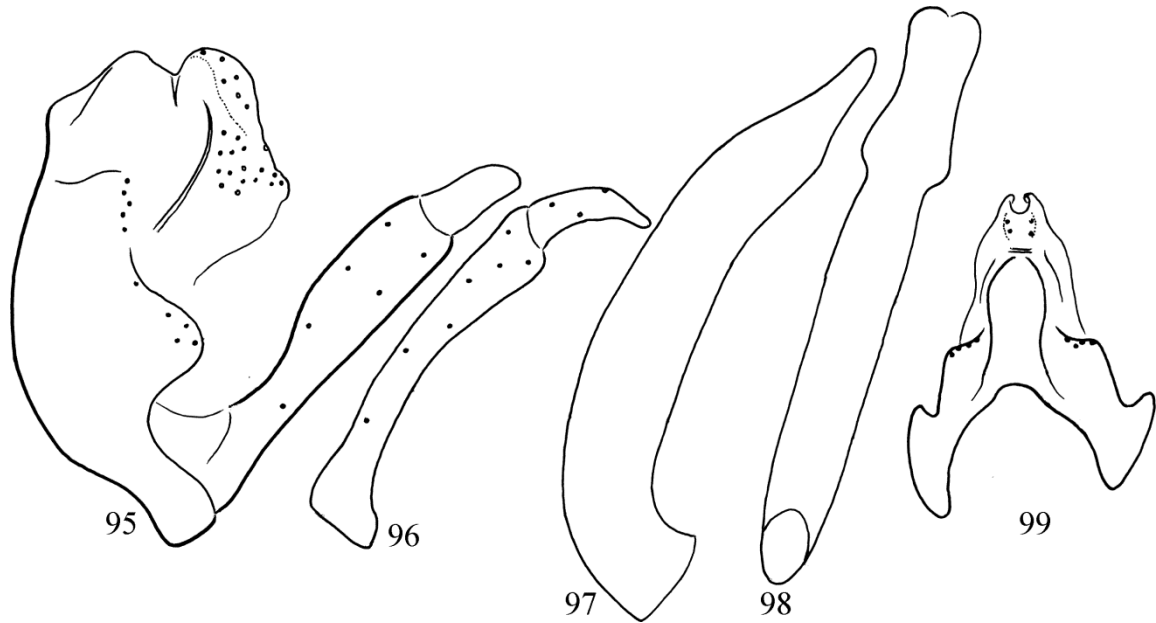
(Map 5)

*Hydropsyche speciophila* Mey, 1981:61–63. “Holotypus ♂: Uzbekistan, Agalyk, 18.VII.1979, 1 ♂” “Die Art ist der *H. sciligra* Malicky nahestehend.”

*Material examined.* **Iran**, Province Mazandaran, Elbursgeb., Sir Ab, 17.VII.1961, leg. J. Klapperich (1 male, OPC).

***Hydropsyche pellucidula* lineage**

*Hydropsyche pellucidula* lineage in the *H. angustipennis* species group is characterized with fused sclerotized endothecal process, without digitiform ventroapical setose lobe and with angular subapical lateral projections before the cleft apex of the phallosome (Oláh & Johanson, 2008).



**Figures 95–99.** *Hydropsyche togana* Oláh & Kerimova, sp. nov. Holotype: 95 = male genitalia in left lateral view, 96 = left gonopod in ventral view, 97 = phallic organ in lateral view, 98 = phallic organ in ventral view, 99 = segment IX and X in dorsal view.

***Hydropsyche consanguinea* McLachlan, 1884**

(Map 4)

*Material examined.* **Azerbaijan**, Nakhchivan AR, Ordubad District, Tivi village, river Tivi, sweep netting, N39°8'0.24" E45°55'47.07", 1917m, 25.VI. 2019, leg. I. Kerimova (23 males, OPC). Azerbaijan, Siyazan District, Galaalty village, N41°5'6.732" E48°56'30.8508", 714m, 10.VI.2019, on light trap, leg. I. Kerimova (6 males, OPC). Azerbaijan, Nakhchivan AR, Ordubad district, environs of the Agdara observatory, 39°06'37.15"N 45°54'50.68"E. 1983 m, 22.VI.2019, on light trap, leg I. Kerimova (29 males, OPC).

***Hydropsyche togana* Oláh & Kerimova, sp. nov.**

(Figures 95–99, Map 4, Photo 50)

*Material examined.* Holotype: **Azerbaijan**, Goygol District, Togana village, river Kurekchay, N40°25'32.30", E46°18'54.05", 1244m, 24.VII. 2019, on light trap. leg. I. Kerimova (1 male, OPC).

*Diagnosis.* This single male represents a new taxon in the *H. pellucidula* lineage among the group of species having lateral profile of the phallic organ with significantly and abruptly narrowing apex, like *H. belisirma*, *H. botoaneanui*, *H. cerkesica*, *H. iberomaroccana*, *H. iokaste*, *H. konya*, *H. morettii* and *H. smiljae*, *H. punica*, *H. trabzonica*. *Hydropsyche togana* sp. nov. differs from all species by having very stout lateral profile of the phallic organ with apex narrowing abruptly both from dorsad and ventrad.

*Description.* Male. Cephalic and thoracic sclerites are dark brown, almost black. Wings dark brown, without pronounced pattern. Maxillary palp formula I-III-II-IV-V. Spur formula 244. Forewing length 12 mm.

*Male genitalia.* Segment IX fused annular and short; its median keel broad, rounded parallel-sided with granulose dorsal surface; apical lobe on posterolateral margin rounded triangular, anterior margin convex. Intersegmental profile between the ninth and tenth segments shallow triangular. Segment X short and high, narrow in

dorsal view; lateral setose area, the cerci fused with ventroapical setose lobe, located in posterad position; dorsoapical setose lobes reduced to the setose anterior area of the unsetose dorsolateral rim of segment X in lateral view. The coxopodit of the gonopod longer than the apex of segment X; harpago with narrowing apex in ventral view. Lateral profile of the phallic organ is very high forming a very stout shape, apex abruptly narrowing both dorsad and ventrad; small triangular subapical lateral projection in ventral view.

*Etymology.* *togana*, named after the type locality, nearby Togana village.

#### ***Hydropsyche instabilis* lineage**

*Hydropsyche instabilis* lineage in the *H. angustipennis* species group is characterized with fused sclerotized endothelial process, with digitiform ventroapical setose lobe and with or without angular subapical lateral projections before the cleft apex of the phallotheca (Oláh & Johanson, 2008).

#### ***Hydropsyche acuta* species complex**

*Hydropsyche acuta* species complex has immovable sclerotized endothelial process on the phallic organ. As an apomorphic state, it is fused to the phallothecal apex. The immovable endothelial process is a character of the *Hydropsyche angustipennis* species group. Therefore *H. acuta* is a member of *H. angustipennis* species group and having digitiform apicoventral setose lobe on segment X, it is a member of *Hydropsyche instabilis* lineage. The digitiform apicomesal process on the harpago delineates these species as a distinct species complex comprised of four species: *H. acuta* Martynov, 1909; *H. derek* Oláh & Kiss, 2015; *H. pupka* sp. nov.; *H. sukula* sp. nov.

Examining a typical contact population with highly varying intermediate shape modifications in the speciation traits produced probably under strong reinforcement of the reproductive character displacement processes (Oláh et al. 2015),

Sipahiler (2018) has questioned the distinct species state of *H. derek* Oláh & Kiss, 2015 and synonymised it with *H. acuta*. Here we have new population samples to demonstrate the remarkable speciation trait stability in pure populations of the *H. acuta* complex.

#### ***Hydropsyche acuta* Martynov, 1909**

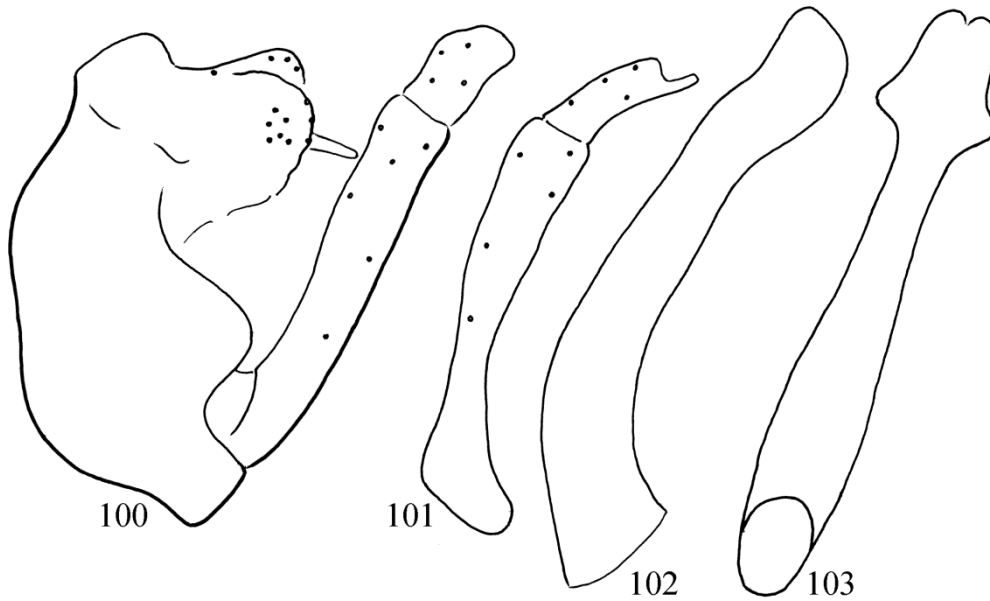
(Figures 100–103, 104–108, Map 6)

*Hydropsyche instabilis* subsp. *acuta* forma  $\alpha$ , Martynov, 1909:542. Two forms of *Hydropsyche instabilis* subsp. *acuta* were described from “Tal des Flusses Tschaldyrka, Gebiet von Kars (now in Turkey, Lake Çildir in Kars Province), 28.VI.1907 (Martynov)” with putative identical phallic organ, but with different apices of harpago, the second segment of the gonopods. Forma  $\alpha$  with rectangularly excised head of harpago producing distinct mesal thin, finger-like projection and forma  $\beta$  having gradually mesad narrowing head of harpago.

*Hydropsyche acuta*: Martynov 1913:38–40. After a long theoretical discussion in Russian, on the criteria of forma, subspecies and species, the forma  $\alpha$  of *Hydropsyche instabilis* subsp. *acuta* collected in the valley of Tschaldyrka River at Kars region by Martynov (now in Turkey, Lake Çildir in Kars Province), was raised to full species status.

*Material examined.* **Georgia**, Samtskhe-Javakheti region, Paravani River below Saghamo Lake, N41°17.588' E43°43.726', 2015m, 14.VII. 2019, leg. T. Kovács, D. Murányi & G. Vinçon (28 males, OPC).

*Remarks.* Two male specimens were identified as *H. acuta* collected from Armenia, rather far from the type locality of *H. acuta* (Oláh & Kiss 2015). Having a new population sample of 28 specimens collected in Georgia, nearby the type locality we have realised that these two specimens from Armenia are not *H. acuta*. They represent a new species described here as *Hydropsyche pupka* sp. nov. The genuine *H. acuta* sample from nearby the type locality collected across the border in Georgia exhibits speciation trait with high shape stability. Both the lateral profile of the phallotheca as well as the ventral profile of the phallotheca head are very stable.



**Figures 100–103.** *Hydropsyche acuta* Martynov, 1909. 100 = male genitalia in left lateral view, 101 = left gonopod in ventral view, 102 = phallic organ in lateral view, 103 = phallic organ in ventral view.

*Contact populations with intermediate hybrids.* Sipahiler (2018b) examining the population of type locality from Lake Çildir in Kars Province has recorded extremely high variabilities both in the lateral and ventral profiles of the phallosheath head as well as in the shape of the digitate mesal process on the harpago. Examining several populations of *Hydropsyche acuta* species complex from Armenia, Azerbaijan, Georgia and Turkey, we have never recorded such great differences in the head profiles of the phallosheath and in the ventral profile of the digitate mesal process on the harpago even between the different taxa. Based on the recorded high variability, real or artificial, it is probable that, at least today, the type locality represents a contact population between *H. acuta* Martynov, 1909 and *H. derek* Oláh & Kiss, 2015. Speciation trait stability in the *Hydropsyche acuta* species complex seems very stable. We have recorded remarkably stable lateral and ventral profiles of the phallic organ in the pure population of *Hydropsyche acuta* from Georgia and in all of the examined populations of *Hydropsyche sukula* sp. nov. collected from Armenia, Azerbaijan, including Nakhchivan, and from Georgia. It seems that the type locality of the holotype of *Hydropsyche derek* may also represent a contact

population with intermediate shape pattern of phallic head at least at two paratypes.

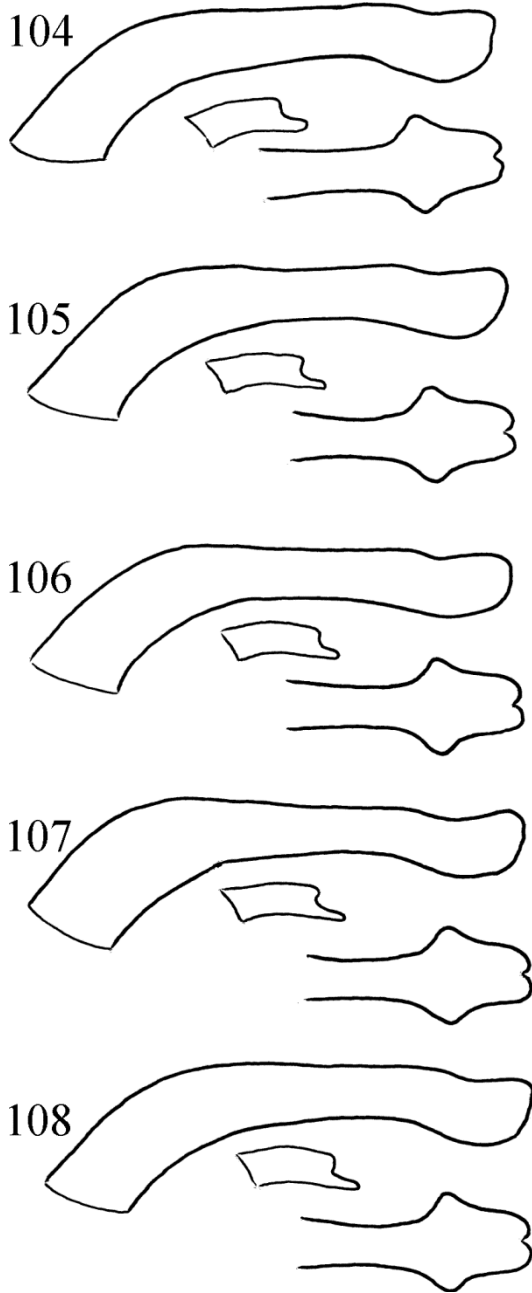
***Hydropsyche derek* Oláh & Kiss, 2015 stat. rest.**

(Figures 109–113, 114–121, Map 6)

*Hydropsyche derek* Oláh & Kiss, 2015:101-102. “Holotype: Turkey, Agri Province, Karasu-Aras Mts. 5km SE of Sarican, 39°47’N 42°28’E, 2000m, 10.VII.2002, leg. B. Benedek & T. Csöväri (1 male, OPC).

*Material examined.* “Holotype: **Turkey**, Agri Province, Karasu-Aras Mts., 5 km SE of Sarican, 39°47’N 42°28’E, 2000 m, 10.VII.2002, leg. B. Benedek & T. Csöväri (1 male, OPC). Paratypes: same as holotype (5 males, OPC). Agri Province, 6 km NE of Cumacay, 39°56’N 43°14’E, 2050 m, 9.VII.2002, leg. B. Benedek & T. Csöväri (2 males, OPC). Agri Province, Karasu-Aras Mts., 5 km SE of Sarican, 39°47’N 42°28’E, 2000 m, 7-8.VII.2000, leg. B. Benedek & T. Csöväri (7 males, OPC).”

*Remarks.* Based upon the re-examination of type material as well as on the comparison of speciation trait stabilities at the sibling species of



**Figures 104–108.** *Hydropsyche acuta* Martynov, 1909. 104–108 = phallic organ in lateral view, head of phallic organ in ventral view and harpago tip of left gonopod in ventral view in five specimens from the same population nearby to locus typicus.

the *Hydropsyche acuta* species complex here we reinstate the species status of *Hydropsyche derek* Oláh & Kiss, 2015.

***Hydropsyche pupka* Oláh, sp. nov.**

(Figures 122–126, 127–131, Map 6)

*Hydropsyche acuta* Martynov, 1909: Oláh & Kiss 2015:99–101. Two male specimens were identified as *H. acuta* collected from River Ayriget at Dastakert, Sisian District, Armenia. Misidentification!

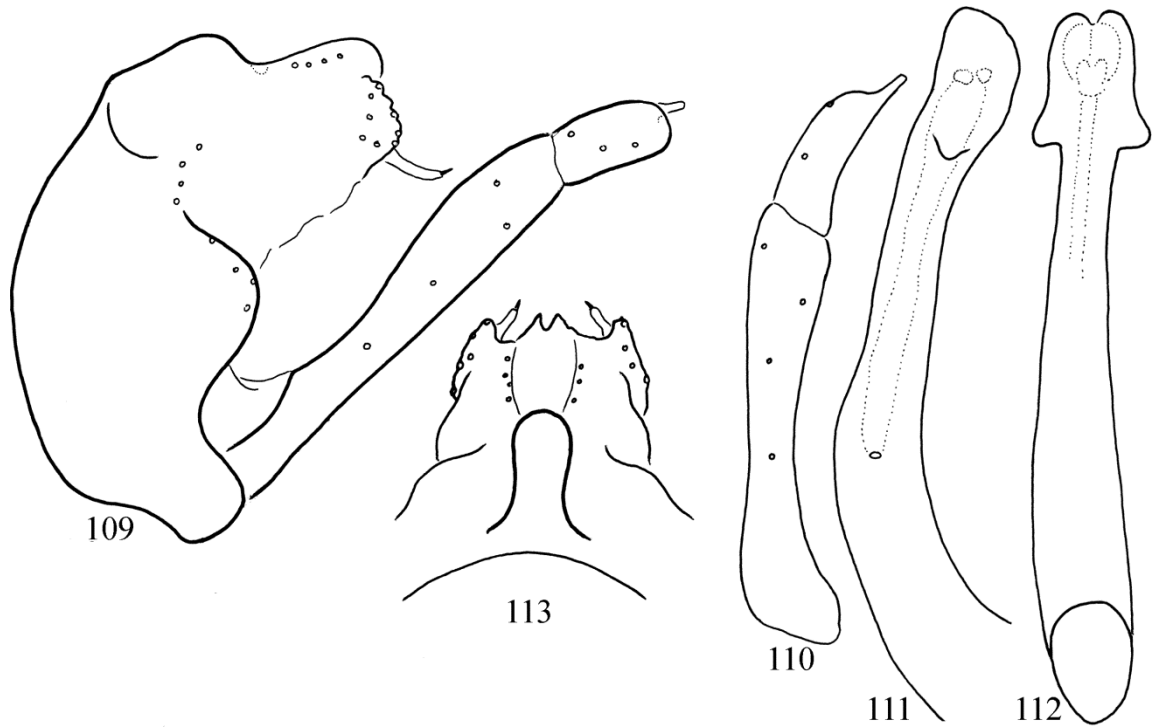
*Material examined.* Holotype: **Armenia**, Sisian District, Dastakert, River Ayriget, 16.VII.1956, leg. L. Zhiltzova (1 male, OPC). Paratype: same as holotype (1 male, OPC).

*Diagnosis.* The new species with harpago having rectangular lateral corner and digitate mesal process is related to *Hydropsyche acuta* but differs by having lateral profile of the apex of the phallic organ with dorsal hump and the ventral profile of the subapical lateral projection more developed, wide triangular.

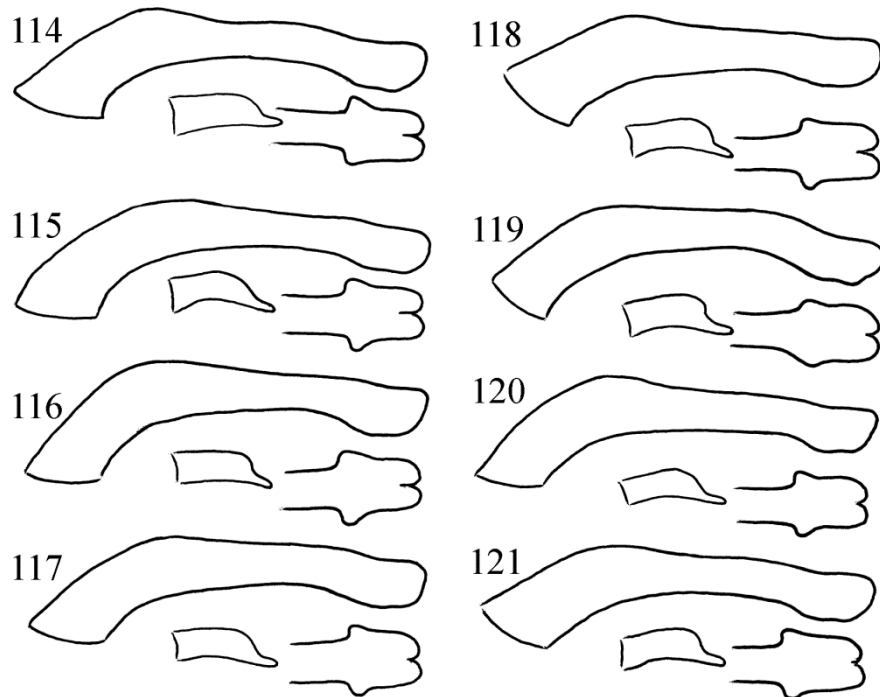
*Description.* Male. Body brown, dorsal thoracic sclerites darker. Wings ochraceous with lighter pubescence, without pronounced pattern. Maxillary palp formula I-III-II-IV-V. Spur formula 244. Forewing length 8 mm.

*Male genitalia.* Segment IX fused annular and short; its median keel parallel-sided, rounded apicad with granulose dorsal surface; apical lobe on posterolateral margin rounded triangular, anterior margin convex. Intersegmental profile between the ninth and tenth segments low step, right angled. Segment X short, rounded quadrangular in dorsal view; lateral setose area, the cerci fused with ventroapical setose lobe, located in posterad position; semicircular in lateral and lobulose in dorsal view; dorsoapical setose lobes forming the setose bases of the unsetose dorsolateral lobes of segment X in lateral view. The coxopodit of the gonopod slightly longer than the apex of segment X; harpago with short digitate mesal process and rectangular lateral apical corner. Phallic organ with produced subapical lateral projection having wide triangular shape in ventral view.

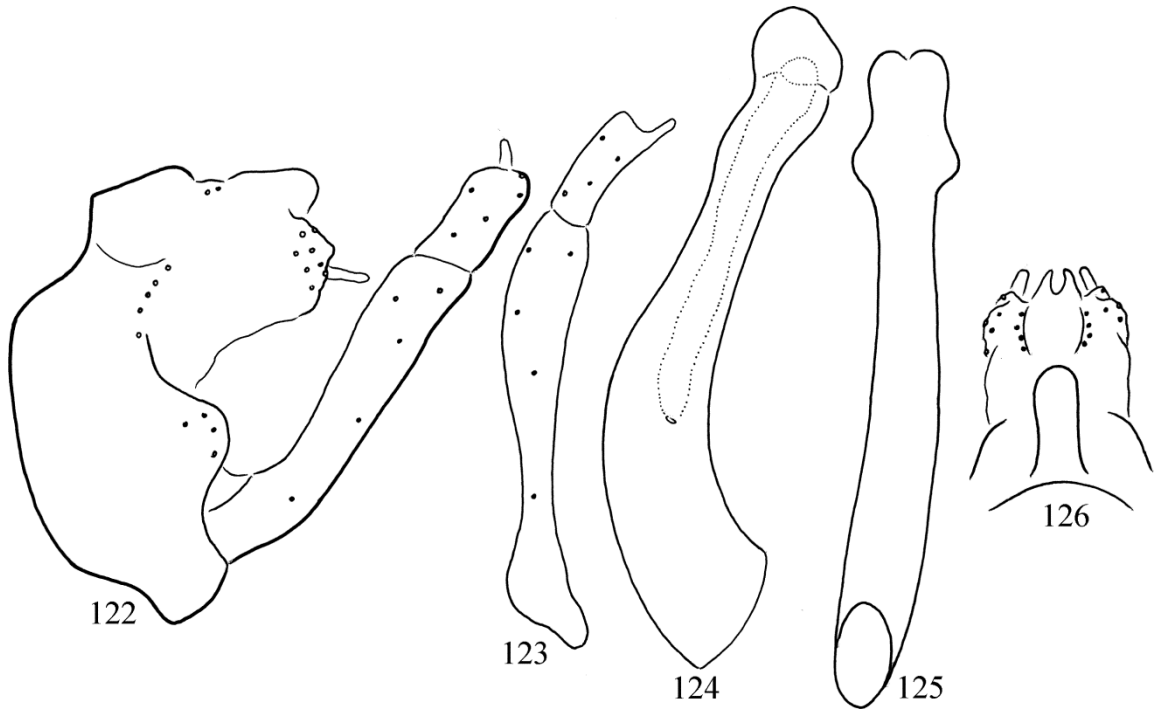
*Etymology.* *pupka*, coined from “púp”, diminutive form of hump in Hungarian, refers to the dorsal hump on the head of the phallic head.



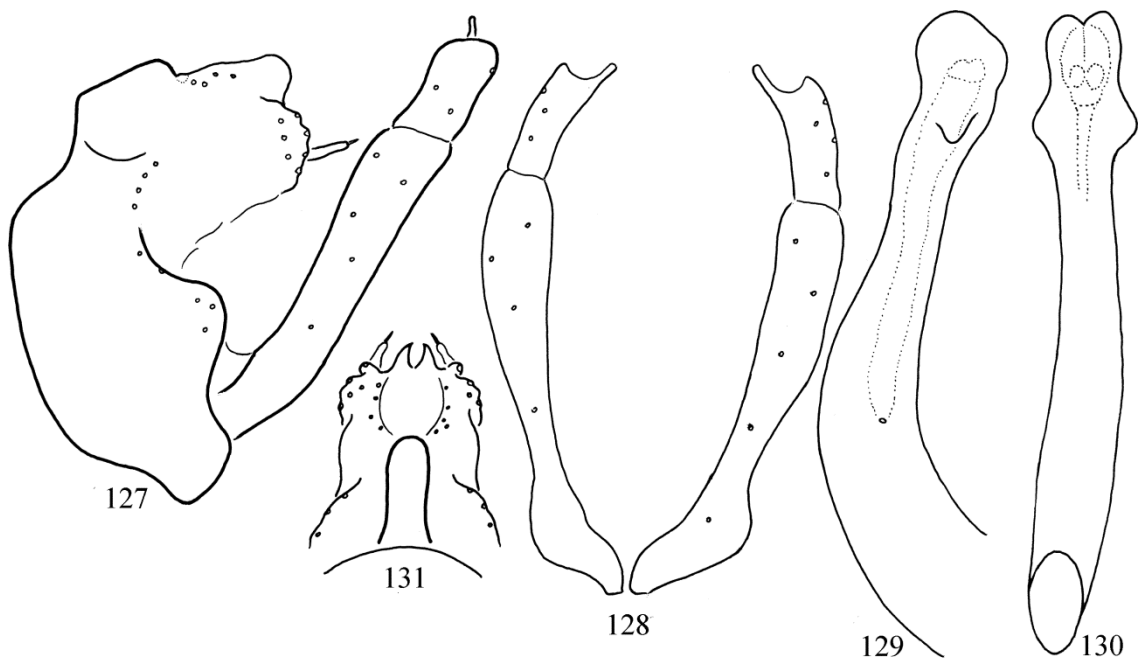
**Figures 109–113.** *Hydropsyche derek* Oláh & Kiss, 2015. 109 = male genitalia in left lateral view, 110 = left gonopod in ventral view, 111 = phallic organ in lateral view, 112 = phallic organ in ventral view, 113 = segment IX and X in dorsal view.



**Figures 114–121.** *Hydropsyche derek* Oláh & Kiss, 2015. 114–121 = phallic organ in lateral view, head of phallic organ in ventral view and harpago tip of left gonopod in ventral view in five specimens from the three populations in Agri Province.



**Figures 122–126.** *Hydropsyche pupka* Oláh, sp. nov. Holotype: 122 = male genitalia in left lateral view, 123 = left gonopod in ventral view, 124 = phallic organ in lateral view, 125 = phallic organ in ventral view, 126 = segment IX and X in dorsal view.



**Figures 127–131.** *Hydropsyche pupka* Oláh sp. nov. Paratype: 127 = male genitalia in left lateral view, 128 = left and right gonopods in ventral view, 129 = phallic organ in lateral view, 130 = phallic organ in ventral view, 131 = segment IX and X in dorsal view.

***Hydropsyche sukula* Oláh, sp. nov.**

(Figures 132–135, 136–141, Map 6, Photo 49)

*Hydropsyche acuta* Martynov, 1909: Schmid 1959: 772–773. “Deuxième article des appendices inférieurs court, robuste et terminé en une pointe fine, bien distincte du reste de l’article. Pénis épais et avec des épaississements latéraux subapicaux très saillants.” Collected in Iran, Tebris Province, Wala-zir, western part of Elbourz mountain range, not far from Azerbaijan and Nakhchivan. Misidentification!

*Hydropsyche acuta* Martynov, 1909: Sipahiler 2004: 188–189. Examined materials have been collected from various regions in Turkey: Ankara, Ardahan, Kars, and Van provinces. The drawings are prepared from Ardahan specimen. Misidentification!

*Hydropsyche acuta* Martynov, 1909: Martynov 1916a: 173–174. Drawn and determined by the dorsal profile of the harpago. Reported from Peninsula Crime. Misidentification!

*Hydropsyche acuta*: Martynov 1913:38–40. Two males and one female specimens collected from a small stream in the Terek River valley at Lars far away from the locus typicus were lumped and identified also as *Hydropsyche acuta* by Martynov. Misidentification!

**Material examined.** Holotype: **Azerbaijan**, Daşkəsən district, Guneykənd, spring and open stream, N40°29.021’ E45°54.080’, 1575m, 2.X.2019, leg. T. Kovács, P. Manko & D. Murányi (1 male, OPC). Paratypes: Azerbaijan, Daşkəsən district, Xoşbulaq, open stream and wetlands above the reservoir, N40°26.523’ E46°02.760’, 1635m, 2.X.2019, leg. T. Kovács, P. Manko & D. Murányi (1 male, OPC). Azerbaijan, Şəmkir district, Könüllü, desert brook along the road, N40°44.638’ E46°12.611’, 385m, 4.X.2019, leg. T. Kovács, P. Manko & D. Murányi (1 male, OPC). Azerbaijan, Guba District, Afurdja (Afurca) village, N41°08’19,7” E048°37’11,3”, 1157m, 8-12.VII.2019, on light trap, leg. I. Kerimova (4 males, OPC). **Armenia**, 3 km NW of Meghri, Lehvaz env., Arevik NP, 38°54’59”N 46°13’12”E, 844 m, 24.IX.2018, at light leg. J. Šumpich (10 m NMPC; 10 m OPC). Armenia, 3 km NW of Meghri, Lehvaz env., Arevik NP, 38°54’59”N, 46°13’12”E, 844 m, 5.VI.2017, at light leg. J. Šumpich (3 m NMPC; 2 m OPC). Armenia, Azat

Reservoir 13 km SE Yerevan, Hatsavan env., 40°04’36”N, 44°36’47”E, 1071 m, 11.VI.2017, at light leg. J. Šumpich (1 m NMPC). Armenia, Areni env., Noravank monastery, 39°41’44”N 45°12’52”E, 1330 m, 10.VI.2017, at light leg. J. Šumpich (1 m NMPC; 1 m OPC). **Georgia**, Kakheti district, Khrukiaskhevi above Shalauri, N41°53.988’ E45°29.243’, 775m, 30.IV.2019, leg. D. Murányi & J. Oboňa (3 males, OPC).

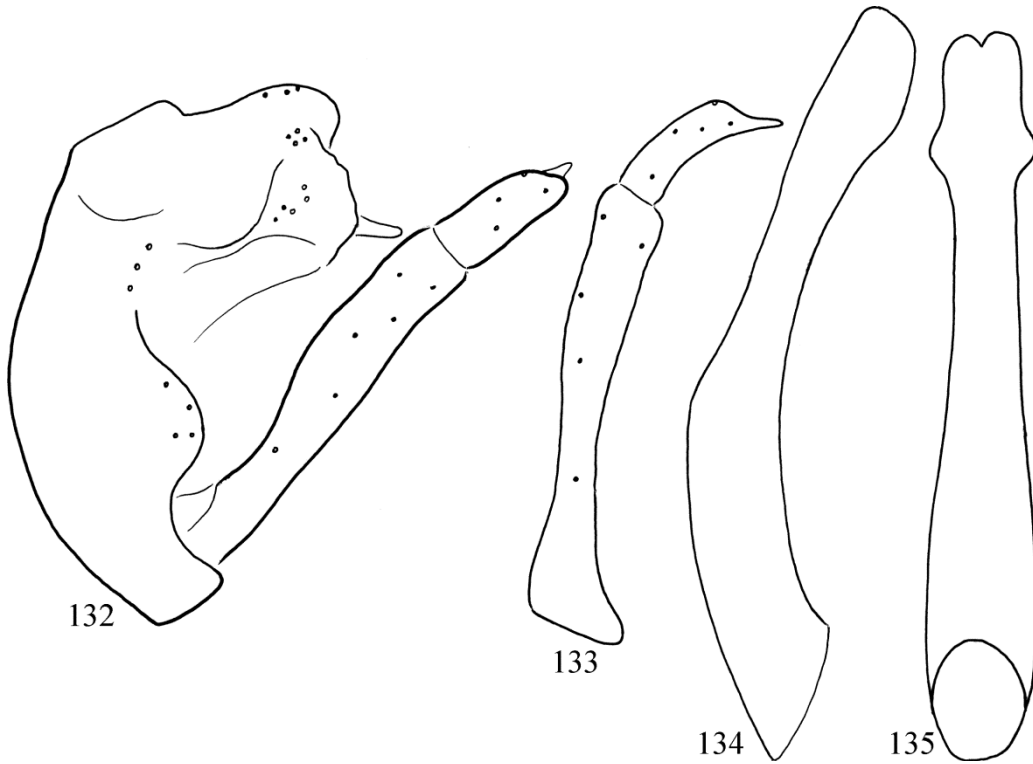
**Diagnosis.** The new species with harpago having rounded, not rectangular lateral corner and gradually narrowing digitate mesal process is related to *Hydropsyche derek*, but differs by having the subapical lateral projection triangular, not right-angled posterad. The most distributed ancestral species of the *Hydropsyche acuta* species complex, distributed from Peninsula Crimea to Iran.

**Description.** Male. Body brown, dorsal thoracic sclerites darker. Wings ochraceous with lighter pubescence, without pronounced pattern. Maxillary palp formula I-III-II-IV-V. Spur formula 244. Forewing length 8 mm.

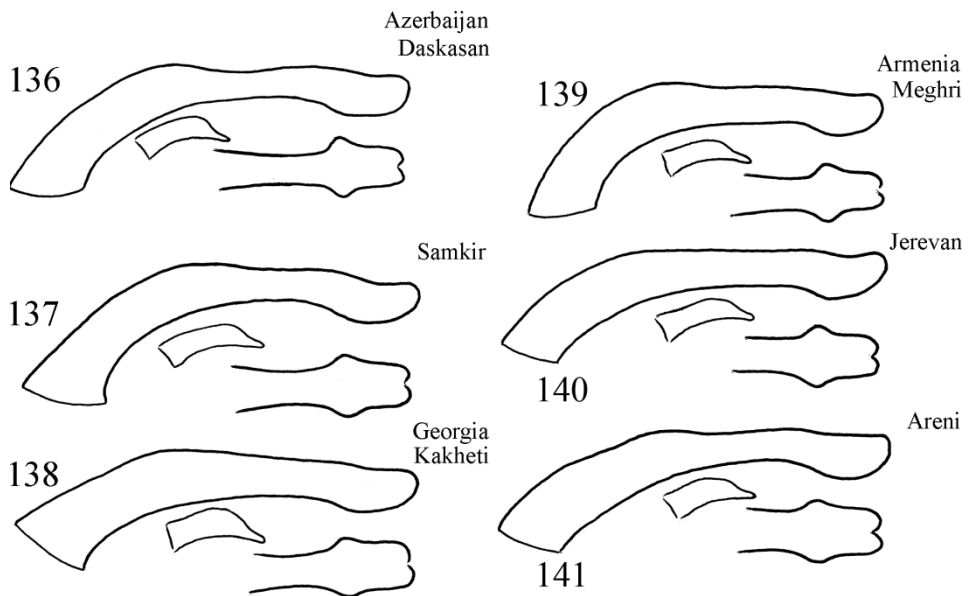
**Male genitalia.** Segment IX fused annular and short; its median keel parallel-sided, rounded apicad with granulose dorsal surface; apical lobe on posterolateral margin rounded, anterior margin convex. Intersegmental profile between the ninth and tenth segments low step, right angled. Segment X short, rounded quadrangular in dorsal view; lateral setose area, the cerci fused with ventroapical setose lobe, located in posterad position; semicircular in lateral and lobulose in dorsal view; dorsoapical setose lobes forming the setose bases of the unsetose dorsolateral lobes of segment X in lateral view. The coxopodit of the gonopod slightly longer than the apex of segment X; harpago with short digitate gradually narrowing mesal process and rounded lateral apical corner. Phallic organ with produced subapical lateral projection having triangular shape in ventral view.

**Etymology.** *sukula*, coined from “szükül”, narrowing in Hungarian, refers to the gradually narrowing of digital mesal process on the harpago.





**Figures 132–135.** *Hydropsyche sukula* Oláh, sp. nov. Holotype: 132 = male genitalia in left lateral view, 133 = left gonopod in ventral view, 134 = phallic organ in lateral view, 135 = phallic organ in ventral view.



**Figures 136–141.** *Hydropsyche sukula* Oláh sp. nov. 136–141 = phallic organ in lateral view, head of phallic organ in ventral view and harpago tip of left gonopod in ventral view at paratypes from Azerbaijan, Georgia and Armenia.

***Hydropsyche ejsaka* Oláh, sp. nov.**

(Figures 142–146, Map 4, Ph 42–43)

*Material examined.* Holotype: **Georgia**, Kvemo Kartli region, Nardevani, open brook and seeps above (S of) the village, N41°32.991' E43°53.232', 1915m, 14.VII.2019, leg. T. Kovács, D. Murányi & G. Vinçon (1 male, OPC). Paratypes: Georgia, Kvemo Kartli region, Aiazmi, Zhamindzori Stream above (S of) the village, 1755m, N41°33.579' E43°54.282', 15.VII.2019, leg. T. Kovács, D. Murányi & G. Vinçon (9 males, OPC).

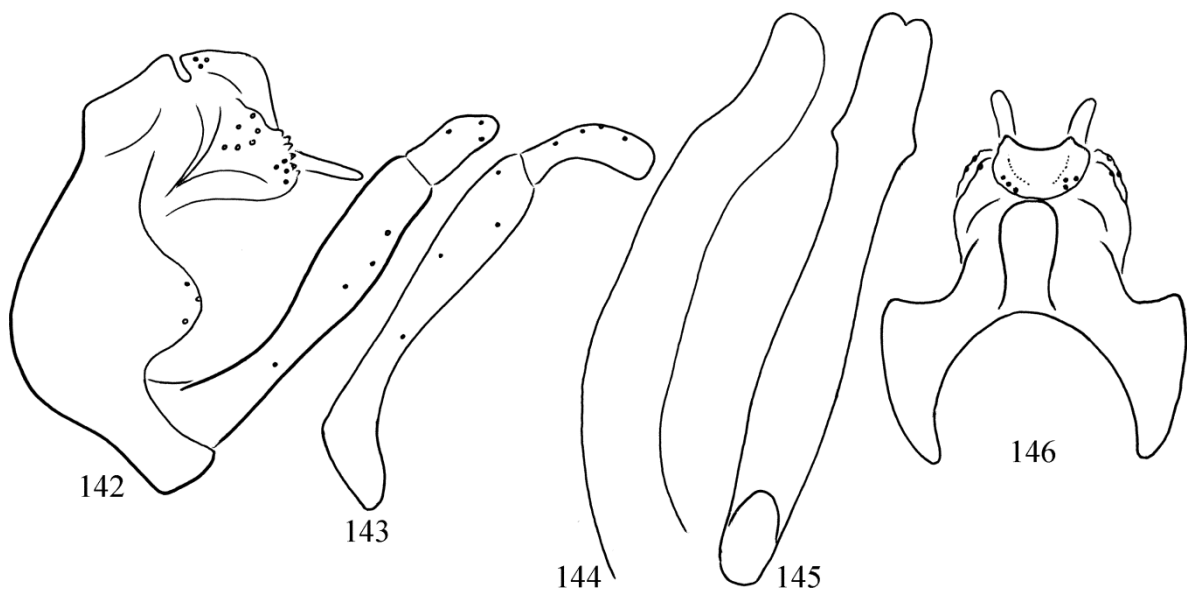
*Diagnosis.* This very dark, almost black new species has a genital structure similar to the very pale and light species, *Hydropsyche lepnevae* Botosaneanu, 1967, described from Georgia, “Adjaria-Caucase (sans localité précise)”, but differs by having the median keel on tergite IX broad, not narrow; the apicomeral lobe of segment IX rounded, not triangular; the digitate process on segment X long, not short; the downward positioned apical region of the phallic organ long, not short and parallel-sided in ventral view, not constricted.

*Description.* Male. Body dark, dorsal thoracic

sclerites darker, almost black. Wings dark brown, without pronounced pattern. Maxillary palp formula I-III-II-IV-V. Spur formula 244. Forewing length 7 mm.

*Male genitalia.* Segment IX fused annular and short; its median keel broad, parallel-sided, rounded apicad with granulose dorsal surface; apical lobe on posterolateral margin rounded, anterior margin convex. Intersegmental profile between the ninth and tenth segments modified into a deep and very short gap. Segment X short, rounded quadrangular in dorsal view; lateral setose area, the cerci fused with ventroapical setose lobe, located in posterad position; semicircular in lateral and lobulose in dorsal view; dorsoapical setose lobes reduced to the setose anterior area of the unsetose dorsolateral rim of segment X in lateral view. The coxopodit of the gonopod longer than the apex of segment X; harpago spatulate. Phallic organ with downward directed apical region and blunt head in lateral view; small triangular subapical lateral projection in ventral view.

*Etymology.* *ejsaka*, coined from “éjszaka”, night in Hungarian, refers to the dark almost night black pigmentation of the cephalic and thoracic sclerites.



**Figures 142–146.** *Hydropsyche ejsaka* Oláh sp. nov. Holotype: 142 = male genitalia in left lateral view, 143 = left gonopod in ventral view, 144 = phallic organ in lateral view, 145 = phallic organ in ventral view, 146 = segment IX and X in dorsal view.

**Spicipalpia**

**Glossosomatidae Wallengren, 1891**

***Glossosoma capitatum* Martynov, 1913**

*Material examined.* **Armenia**, Areni env., Noravank monastery, rocky steppe, 39°41'44"N, 45°12'52"E, 1330m, 2.+10.vi.2017 (1 male, 1 female, NMPC), the same but 21.+29.IX.2018 (2 males, 5 females, NMPC); Davit Bek Reservoir, 75km N of Kapan, deciduous forest, 39°20'24"N, 46°24'29"E, 1380m, 3.VI.2017 (1 male, NMPC); Arevik National Park, 2.3 km NW of Aygedzor, Lichtkvaz, mountain steppe, rocks, 38°59'25"N, 46°11'09"E, 1355m, 4.VI.2017 (1 male, NMPC), the same but 23.IX.2018 (1 male, NMPC); Arevik National Park, 3km NW of Meghri, Lehvaz env., rocky steppe, gorge, 38°54'59"N, 46°13'12"E, 844m, 5.VI.2017 (2 females, NMPC), the same but 24.IX.2018 (4 males, 9 females, NMPC); Arevik National Park, Shvanidzor env., rocky steppe, 38°56'34"N, 46°22'57"E, 780m, 8.VI.2017 (3 males, NMPC), the same but 26.IX.2018 (1 male, NMPC); Arevik National Park, 3.2km NE of Meghri, Artsvakar, gorge, rocky steppe, 38°55'15"N, 46°16'17"E, 750m, 25.IX.2018 (13 males, 11 females, NMPC); Azat Reservoir, 13km SE of Yerevan, Hatsavan env., steppe, 40°04'36"N, 44°36'47"E, 1071m, 1.X.2018 (6 females, NMPC); leg. all Jan Šumpich. **Azerbaijan**, Nakhchivan AR, Ordubad district, environs of the Agdara observatory, 39°06'37.15"N 45°54'50.68"E, 724m, 22.VI.2019, on light trap, leg I. Kerimova (1 male, OPC); tributary of Talacay River above Car NE of Zaqatala, 41°40'41"N, 46°41'58"E, 950 m, 9.V.2019, leg. D. Murányi & J. Oboňa (2 males, NMPC). **Georgia**, Adjara, Mtirala NP, Chakvistavi 20km NE Batumi, Chakvistiskali riv., 41°40'44"N, 41°51'45"E, 250m, 30.VI.2013, leg. P. Chvojka (1 male, 13 females, NMPC); Kakheti, Batsara Nat. Res., Batsara R., tributaries, springs, 42°13'21"N, 45°18'12"E, 805m, 2.V.2019, leg. D. Murányi & J. Oboňa (1 male, NMPC); Kakheti, Batsara Nat. Res., Samkura R. N Zibakhevi, 42°15'11"N, 45°19'56"E, 885m, 2.V.2019, leg. D. Murányi & J. Oboňa (1 female, NMPC); Kvemo Kartili, Khrami R. above Nakhiduri, 41°28'04"N, 44°41'40"E,

420m, 29.IV.2019, leg. D. Murányi & J. Oboňa (2 males, 2 females, NMPC); Kvemo Kartili, Lokistsali brook, Poladauri, 41°19'52"N, 44°29'54"E, 700m, 29.IV.2019, leg. D. Murányi & J. Oboňa (1 male, 1 female, NMPC). **Georgia**, Samtskhé-Djavakhétie region, small river, > Zarzma village, N41°40'23" E42°38'29", 1250m, 16.VII.2019, leg. G. Vinçon (1 male, OPC).

***Glossosoma unguiculatum* Martynov, 1925**

*Material examined.* **Azerbaijan**, Nakhchivan AR, Ordubad District, Tivi village, river Tivi, sweep netting, N39°8'0.24" E45°55'47.07", 25.VI.2019, leg. I. Kerimova (1 male, OPC). **Georgia**, Mtskheta-Mtianeti region, Gveleti, Tibistskali Stream above its mouth to Terek River N42°42.605' E44°37.597', 1440m, 12.VII.2019, leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (1 male, OPC).

***Agapetus caucasicus* Martynov, 1913**

(Map 7)

*Material examined.* **Azerbaijan**, Lankaran region, Astara District, Talysh Mts, Sipiapart, Tangarud Stream in gallery forest, N38°31.560' E48°41.715', 215m, 24.IX.2018, leg. D. Murányi et al. (1 male, OPC).

***Agapetus gorgitensis* (Sipahiler, 1996)**

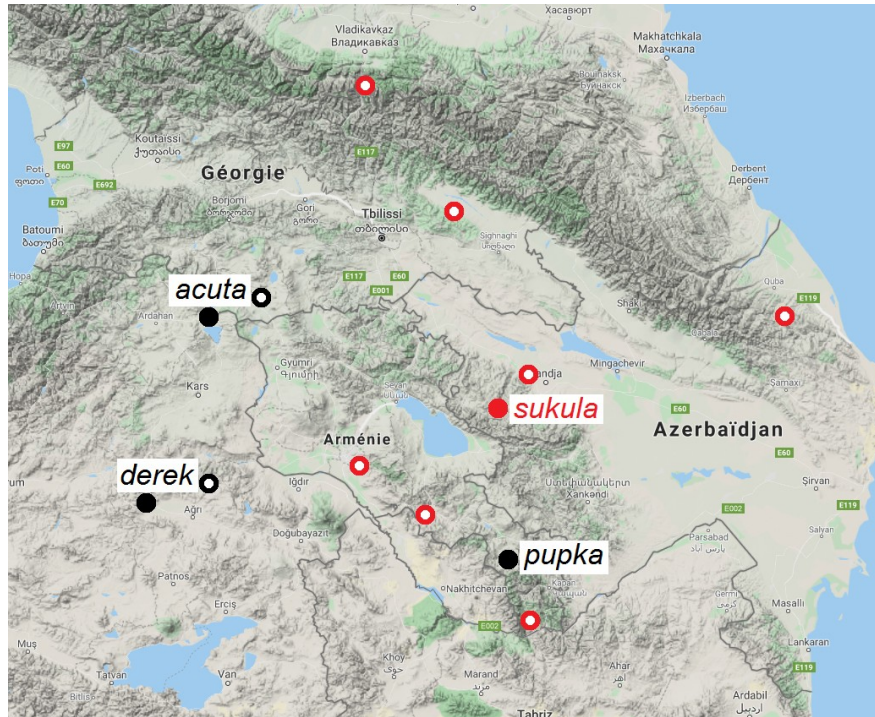
(Map 7)

*Material examined.* **Georgia**, Adjara, Mtirala NP, Chakvistavi 20 km NE Batumi, brooks, 41°40.6'N, 41°52.4'E, 315m, 30.VI.2013, leg. P. Chvojka (9 males, 17 females, NMPC); Svanetia, brook, left tributary of Mulkhura Riv. SE of Mestia, 43°02.4'N, 42°45.5'E, 1490m, 5.VII.2013, leg. P. Chvojka (2 males, 11 females, NMPC).

***Agapetus gouriensis* Oláh & Vinçon, sp. nov.**

(Figures 147–150, Map 7, Photo 20–21)

*Material examined.* Holotype: **Georgia**, Gouria region, spring and brooks with snow, tributary



Map 6. Distribution of *Hydropsyche acuta* species complex (full circles represent the type localities)



Map 7. Distribution of *Agapetus* species (full circle represents the type locality)

of Bzhuzhi River, below Gomismta, 41°49'57" N, 42°09'21"E, 1910-1980m, 24.IX.2019, leg. G. Vinçon (1 male, OPC).

**Diagnosis.** This new species is close to *Agapetus gorgitensis* (Sipahiler, 1996) described from the crossborder Artvin province of Turkey, but differs by both the lateral and ventral view of the gonopods as well as by the shape of the sclerite of the aedeagus.

**Description.** Male (in alcohol). Dark 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; Fork I on hindwing lost. Blister-like protuberance on the dorsal margin of sternite V absent, upward directed filament present; ventral process on sternite VI short.

**Male genitalia.** Segment IX synsclerotized with slightly convex anterior and posterior margin in lateral view. Segment X less pigmented, deeply divided up to the basement in dorsal view. Cerci elongated. Gonopods quadrangular, elongated clavate in lateral view; subapical dorsomesal lobes with dentate mesal margin. Aedeagus indistinct tube with distinct trifid sclerite inside.

**Etymology.** Named after the type locality.

***Agapetus oblongatus* Martynov, 1913**

(Map 7)

**Material examined.** Georgia, Mtskheta-Mtianeti region, Sno, karst stream below (N of) the village, N42°36.937' E44°37.640', 1765m, 12.VII.2019, leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (4 males, OPC).

**Hydroptilidae**

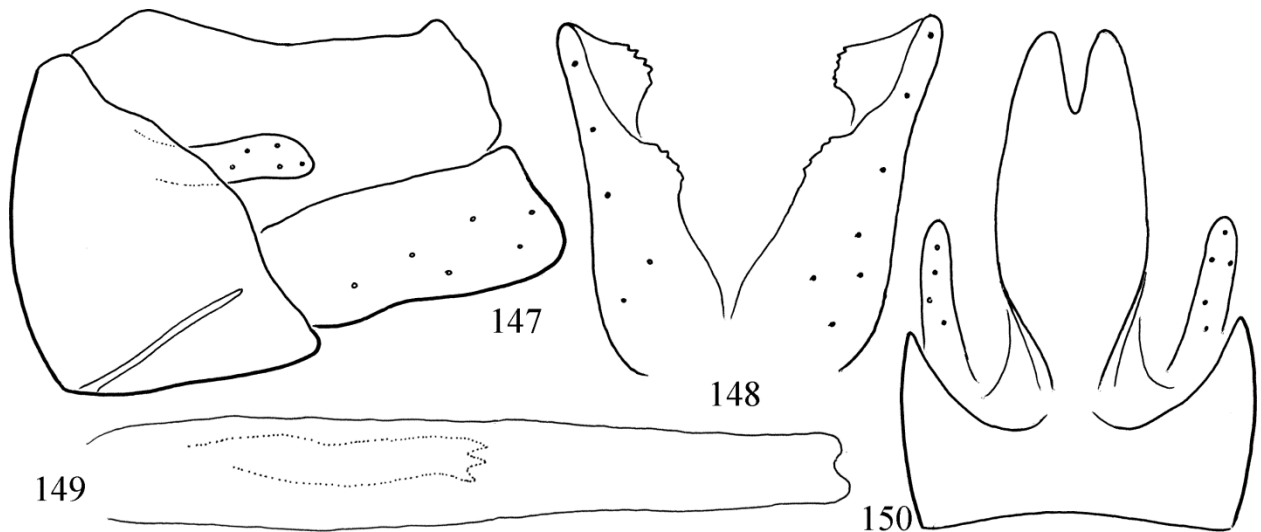
**Hydroptilinae**

***Hydroptila armathai* Schmid, 1959**

**Material examined.** Azerbaijan, Lankaran region, Lerik district, Talysh Mts, Burkandul, Lankaran River with alder gallery, N38°48.085' E48°31.055', 445m, 22.IX.2018, leg. D. Murányi et al. (1 male, OPC).

***Hydroptila lotensis* Mosely, 1930**

**Material examined.** Azerbaijan, Lankaran region, Lerik district, Talysh Mts, Burkandul, Lankaran River with alder gallery, N38°48.085' E48°31.055', 445m, 22.IX.2018, leg. D. Murányi et al. (2 males, OPC).



**Figures 147–150.** *Agapetus gouriensis* Oláh & Vinçon sp. nov. Holotype: 147 = male genitalia in left lateral view, 148 = gonopods in ventral view, 149 = phallic organ in dorsal view, 150 = segment IX and X in dorsal view.

***Hydroptila vectis* Curtis, 1834**

*Material examined.* **Georgia**, Mtskheta-Mtianeti region, Mejilauri, forest and bushy springs and outlets, N42°19.423' E44°38.732', 1270m, 13.VII.2019, leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (1 male, OPC).

**Ptilocolepinae**

***Ptilocolepus colchicus* Martynov, 1913**

*Material examined.* **Georgia**, Adjara, Mtirala NP, Chakvistavi 20 km NE Batumi, brooks, 41°40.6'N, 41°52.4'E, 315 m, 30.VI.2013, leg. P. Chvojka (5 males, 4 females, NMPC); the same but spring brook, 41°40.7'N, 41°51.8'E, 280 m, 30.VI.2013, leg. P. Chvojka (1 male, 1 female, NMPC); the same but stream, 41°40.5'N, 41°52.2'E, 320 m, 30.VI.2013, leg. P. Chvojka (2 males, NMPC); Kakheti, Batsara Nat.Res., Samkura R. and Khadori waterfall, 42°16'28"N, 45°21'06"E, 1250 m, 2.V.2019, leg. D. Murányi & J. Oboňa (8 males, 2 females, NMPC); Kakheti, tributary of Stori River NE of Lechuri, 42°13'02"N, 45°28'32"E, 1216m, 3.V.2019, leg. D. Murányi & J. Oboňa (1 female, NMPC); Svanetia, Bagvdanari NW of Mestia, source area, 43°04.1'N, 42°37.1'E, 1550m, 4.VII.2013, leg. P. Chvojka (2 males, NMPC); Svanetia, Ushkhvanari W Mestia, source area, 43°03.5'N, 42°37.1'E, 1520m, 4.VII.2013, leg. P. Chvojka (1 male, 2 females, NMPC); Svanetia, brook, left tributary of Mulkhura riv. SE of Mestia, 43°02.4'N, 42°45.5'E, 1490m, 5.VII.2013, leg. P. Chvojka (1 male, 1 female, NMPC); the same but 43°02.5'N, 42°46.3'E, 1510m, 5.VII.2013, leg. P. Chvojka (2 males, NMPC); Svanetia, stream N of Mestia, 43°03.0'N, 42°43.1'E, 1510-1700m, 5.VII.2013, leg. P. Chvojka (13 males, 1 female, NMPC). **Georgia**, Gouria region, brooklet and cascade, tributary of Bzhuzhi River, 41°51'03"N, 42°06'55"E, 660m, 24.IX.2019, leg. G. Vinçon (1 male, OPC).

***Ptilocolepus dilatatus* Martynov, 1913**

*Material examined.* **Georgia**, Adjara, Mtirala NP, Chakvistavi 20 km NE Batumi, brooks,

41°40.6'N, 41°52.4'E, 315 m, 30.VI.2013, leg. P. Chvojka (25 v males 9 females, NMPC); the same but spring brook, 41°40.7'N, 41°51.8'E, 280 m, 30.VI.2013, leg. P. Chvojka (15 males, 10 females, NMPC); the same but stream, 41°40.5'N, 41°52.2'E, 320m, 30.VI.2013, leg. P. Chvojka (26 males, 18 females, NMPC); the same but springs and brooks, 41°40.4'N, 41°51.2'E, 410 m, 1.VII.2013, leg. P. Chvojka (56 males, 31♀ females NMPC); Imereti, Pereval Nakeraľskii, tributary of Tkibula River, 42°22'55"N, 43°01'07"E, 1016 m, 18.IX.2018, leg. J. Oboňa (1 male, 1 female, NMPC). **Georgia**, Mtskheta-Mtianeti region, sidestream of Terek r. with small waterfall in narrow rocky ravine, below Tsdo village, 1710m, 42°40'56.379"N, 44°37'58.846"E, 6.VII.2019, leg. P. Manko (1 male, OPC). **Georgia**, Adjara, Kintrishi Nature Reserve, sidebrook of Cherulisghele Stream, N41°44.003' E42°04.922', 1040m, 26.IX.2019, leg. T. Kovács, D. Murányi, & G. Vinçon (1 male, 1 female, OPC). **Georgia**, Gouria region, brooklet, tributary of Bzhuzhi River, above Gomi, 41°52'25" N, 42°06'19"E, 390m, 24.IX.2019, leg. G. Vinçon (7 males, 1 female, OPC).

**Rhyacophilidae Stephens, 1836**

***Philocrena trialetica* Lepneva, 1956**

(Map 8)

*Philocrena* Lepneva nov. gen. Lepneva, 1956:900–901. Described from the larval stage. „Larve 5. Stadium. Körper dorsoventral nicht flachgedrückt, sich gegen Hinterende erweiternd. Die Oberfläche der Skletite dicht mit kleinen Chaetoiden bedeckt; primäre Borsten, mit Ausnahme derjenigen des IX. Abdominalsegmentes und der Anallflüße, verkürzt, einige reduziert. In den Maxillarpalpen ist das 2. Glied nicht wie bei *Rhyacophila* länger als das erste, sondern kürzer.“

*Philocrena trialetica* Lepneva sp. nov. Lepneva, 1956:899–911. Described from the larval stage. “*Philocrena* ist eine sehr alte Gattung, die in ihrer larvalen Phase, nebst einer hohen Spezialisierung, manche ursprüngliche, sehr primitive Züge beibehalten hat, nämlich: die Form des Submentums und der Maxillarpalpen, die Struktur der Brustpleuriten, die Form der Beine, teilweise auch die der Analklaue, das Fehlen der Kiemen.“

“Fundort – in den Quelbäche des Hochgebirgsgebietes Transkaukasiens.”

*Philocrena trialetica* Lepneva, 1956: Kumanski 1981: 63. “Two species labelled “*Rhyacophila* n. sp.” were found by the author in the collection of the Zoological Institute, Leningrad. Labelled by Prof. S. G. Lepneva, later on they have remained undescribed. One of them was mentioned by Lepneva (1957) as “*Rhyacophila mitarbiensis* n. sp.”. This is a nomen nudum. The specimens of the second “*Rhyacophila*” are considered here as the probable adults of *Philocrena trialetica* Lepn. – a genus and species described and known so far after the larva.” 67–69: differential diagnosis: “Closed discoidal cell in both pairs of wings in both sexes; last abdominal segments with rather simplified structure, without strongly chitinized elements; in the male, 10<sup>th</sup> segment forming ventrally a vast membranous body, dorsally with two lateral lobes, each of them giving distally a flat horizontal appendage. Phallic apparatus in form of a simple membranous tube with a strong apical spine, caudally partly protruded, without parameres and lobes. Harpago without inner spinulate zone.” “All other features of these insects (ocelli, palpi, spurs etc.) are well corresponding to those of the genus *Rhyacophila*. Although within the family Rhyacophilidae a closed DC could be found only in some genera of the subfamily Hydrobiosinae (entirely lacking in Holarctics). “Material and locality: Georgian SSR, Bakuriani, rivulet Bakurianka (Station 122, sample 160a), 27.7.1953, 2♂♂ in alcohol; the same locality (Station 135, sample 187), 3.8.1953, one ♀ (pinned), leg. L. Zhiltzova.

*Philocrena trialetica* Lepneva, 1956: Sipahiler 1998:11. Reported from four localities of Turkey, Artvin region: Borçka, Camili, Ugurköy, 1000m, 6.VIII.1995; Gomvan, yaylasi, 2000 m, 1.VIII.1995; Mereta yaylasi, 2500 m, 3.VIII.1995; Leko-ban yaylasi, 2500 m, 8.VIII.1996.

**Material examined.** Georgia, Adjara, Tsivadzebi, forest brook along the road, N41°39.939' E42°08.857', 495m, 25.IX.2019, leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (1 male, OPC).

**Remarks.** The monobasic genus *Philocrena* was collected and described from the spring area of Bakurianka stream, above Bakuriani. The particular spring area of the stream is located between 2460–2470m representing several springs creating

the upper (crenal, hypocrenal) region of Bakurianka stream and flowing together at 2450m forming the start of Bakurianka stream. The discovery of the species in Adjara region and at an elevation of only 495 m may motivate a detailed comparison with specimens from the locus typicus of the spring area of Bakurianka stream. The highly modified, apomorphic state of the complex of segment X, epiproct and paraproct is characterized by loss of sclerotization. Any kind of divergences organised in the amorphic membranous structures is rather puzzled. However, the detection of initial split of phylogenetic incipient divergence needs population samples of several specimens.

### *Rhyacophila tristis* species group

#### *Rhyacophila abchasica* species complex

*Rhyacophila abchasica* Martynov, 1934, a member of the *Rhyacophila tristis* species group was described from specimens collected in Gagra, Abkhasia (Martynov, 1934). It differs from the *Rhyacophila spinulata* species complex by the elongated pair of lateral lobes of the aedeagus. Four species belong to this complex: *R. abchasica* Martynov, *R. nakra* Oláh & Vinçon sp. nov., *R. kveda* Oláh & Vinçon sp. nov., *R. zekara* & Vinçon Oláh sp. nov.

#### *Rhyacophila abchasica* Martynov, 1934

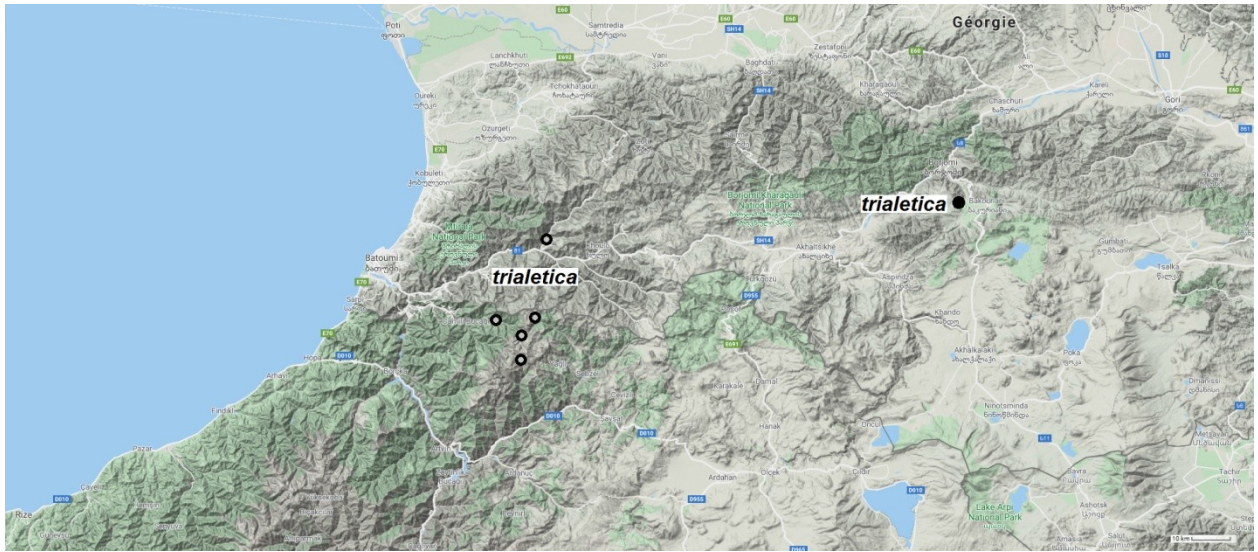
(Map 9)

*Rhyacophila abchasica* Martynov, 1934:61. “Structure of ♂ genitalia very similar to that in *Rh. spinulata* Mart. 10<sup>th</sup> segment small, transversally oval, its median excision narrow, in form of a cleft. Upper portion of the penis subdivided into two lobes; lower portion forming two slender stick-shaped processes, beneath of them a shorter lobe is situated. 9<sup>th</sup> segment brownish-yellow, the 10<sup>th</sup> brown.” “Mountainous torrent at Gagry, district of Abkhasia.”

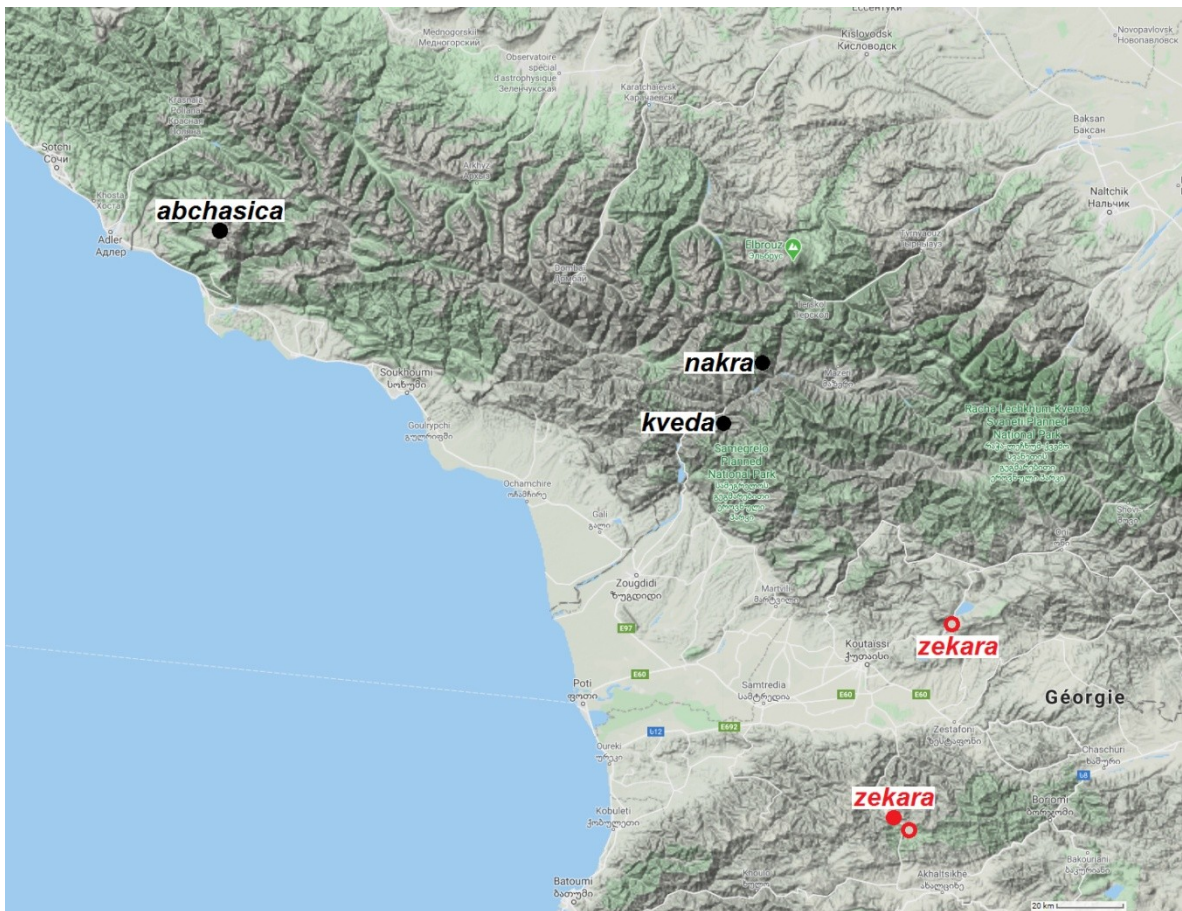
#### *Rhyacophila kveda* Oláh & Vinçon, sp. nov.

(Figures 151–154, Map 9, Photos 1–2)

**Material examined.** Holotype: Georgia, Mingrelia and High Svanetia region, Khaishura

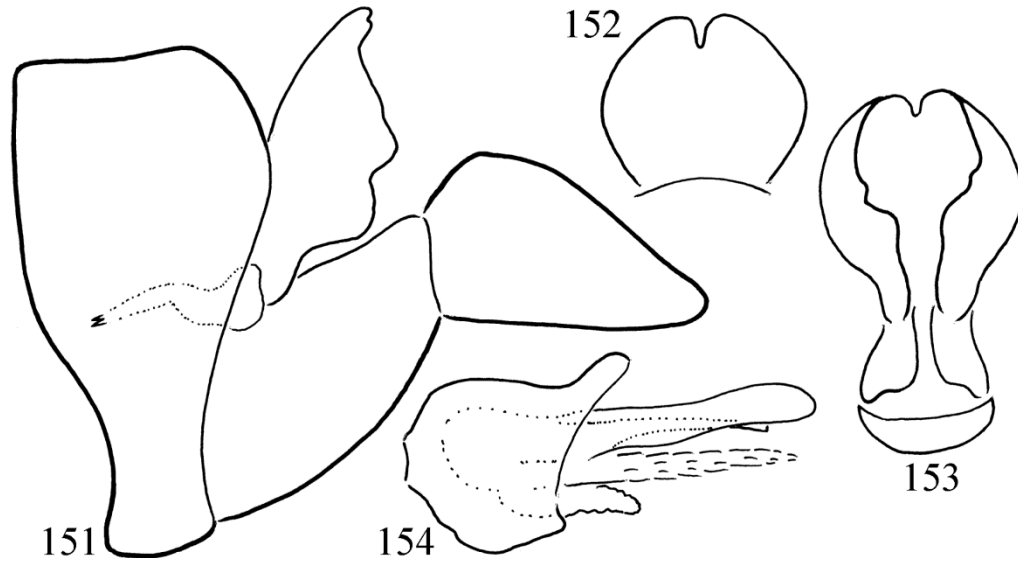


Map 8. Distribution of *Philocrena trialetica* (full circle represents the type locality)



Map 9. Distribution of *Rhyacophila abchasica* species complex (full circles represent the type localities)





**Figures 151–154.** *Rhyacophila kveda* Oláh & Vinçon sp. nov. Holotype: 151 = male genitalia in left lateral view, 152 = segment X in dorsal view, 153 = segment X with epiproct and paraproct in caudal view, 154 = phallic organ in lateral view.

River tributary, same torrent above Kveda Vedi until its spring, 42°54'47" N, 42°11'05"E, 1300–1500m, 22.IX.2019, leg. G. Vinçon (1 male, OPC).

*Diagnosis.* Having oblique vertical directed segment X with fused discernible epiproct and with membranous tergal strap this new species belongs to the *Rhyacophila tristis* species group; with its elongated pair of lateral lobes of the aedeagus, it belongs to the *Rhyacophila abchasica* species complex and most close to its sibling species *R. nakra* sp. nov. but differs by the produced bilobed apical margin of segment X as well as by the apical pattern of segment X.

*Description.* Head, antennae, maxillary palps, legs and segmental sclerites dark brown. Forewing brown without any pattern in alcohol, forewing length 9 mm. Segment X with apical margin having a produced middle double lobed region in lateral view. Lateral shape of the harpago, the second segment of the gonopods with elongated ventral lobe. Phallic organ is particularly organised; phallobase together with the phallosome has a dorsal heavily sclerotized, rather long process with membranous tergal strap connecting segment X to the phallic organ;

endotheca clearly membranous sunken or immersed into phallobase; aedeagus seems rather complex composed of a membranous ventral lobe, a pair of long digitiform lateral lobes and a thin rod-like structure, probably the enforced, chitinised ductus ejaculatoricus difficult to discern because it is hidden between the less sclerotized large lateral lobes; the paramere is represented by a pair of thin filaments of spines, difficult to discern.

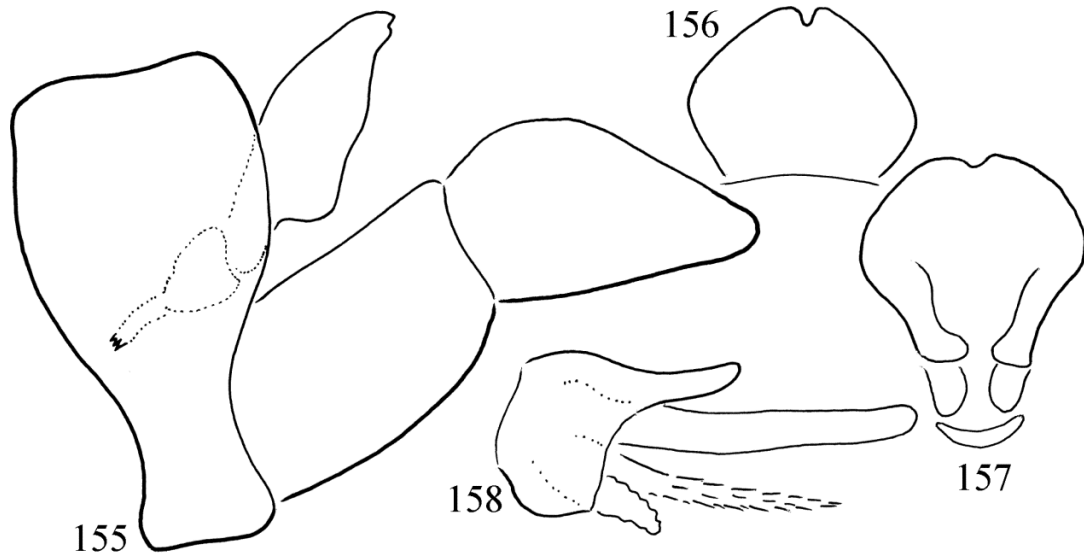
*Etymology.* *kveda*, named after the type locality.

***Rhyacophila nakra* Oláh & Vinçon, sp. nov.**

(Figures 155–158, Map 9, Photos 3–5)

*Material examined.* Holotype: **Georgia**, Mingrelia and High Svanetia region, brooklet and spring NW above the camping place, Nakra valley, Utviri tributary, 43°04'49" N, 42°19'41"E, 2300–2500m, 23.IX.2019, leg. G. Vinçon (1 male, OPC).

*Diagnosis.* Having oblique vertical directed segment X with fused discernible epiproct and with membranous tergal strap this new species belongs to the *Rhyacophila tristis* species group;



**Figures 155–158.** *Rhyacophila nakra* Oláh & Vinçon, sp. nov. Holotype: 155 = male genitalia in left lateral view, 156 = segment X in dorsal view, 157 = segment X with epiproct and paraproct in caudal view, 158 = phallic organ in lateral view.

with its elongated pair of lateral lobes of the aedeagus, it belongs to the *Rhyacophila abchasica* species complex and most close to its sibling species *R. kveda* sp. nov. but differs by the straight apical margin of segment X as well as by the apical pattern of segment X.

**Description.** Head, antennae, maxillary palps, legs and segmental sclerites dark brown. Forewing brown without any pattern in alcohol, forewing length 8 mm. Segment X is with almost straight apical margin. Lateral shape of the harpago, the second segment of the gonopods with elongated ventral lobe. Phallic organ is particularly organised; phallobase together with the phalotheca has a dorsal heavily sclerotized, rather long process with membranous tergal strap connecting segment X to the phallic organ; endotheca clearly membranous sunken or immersed into phallobase; aedeagus seems rather complex composed of a membranous ventral lobe, a pair of long digitiform lateral lobes and a thin rod-like structure, probably the enforced, chitinised ductus ejaculatoricus difficult to discern because it is hidden between the less sclerotized large lateral lobes; the paramere is represented by a pair of thin filaments of spines, difficult to discern.

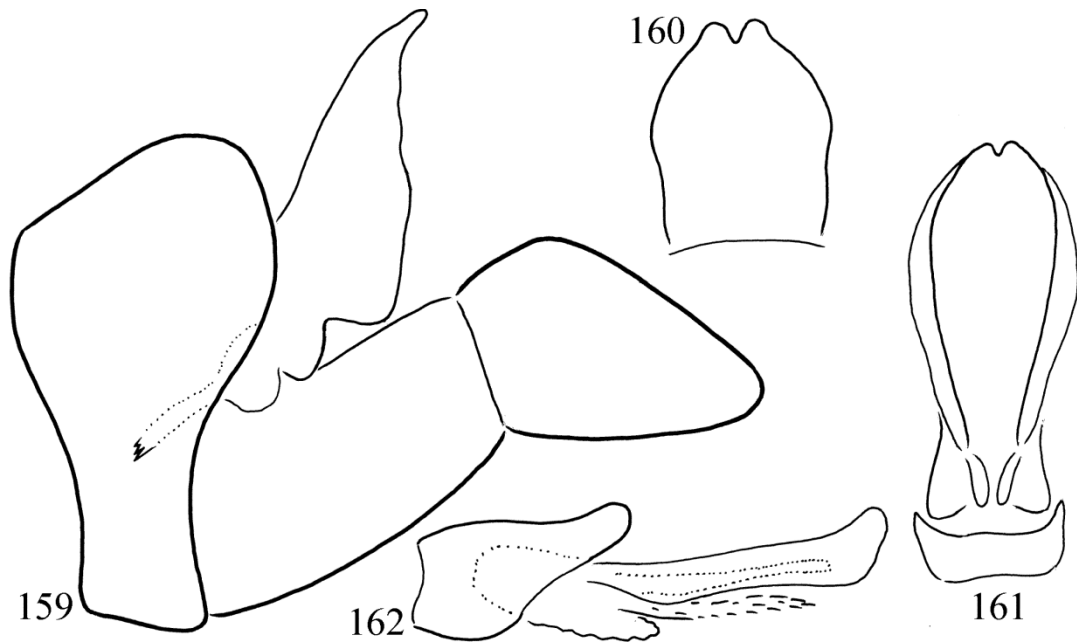
**Etymology.** *nakra*, named after the type locality.

***Rhyacophila zekara* Oláh & Vinçon, sp. nov.**

(Figures 159–162, Map 9, Photo 34, 36)

**Material examined.** Holotype: **Georgia**, Imereti region, steep brook and spring above the road, north slope of Zekari pass, Kershaveti tributary, 41°50'45"N, 42°48'31"E, 2150–2200m, 28.IX.2019, leg. G. Vinçon (1 male, OPC). Paratype: Georgia, limit of Imereti and Samtskhe-Javakheti regions, Brook and spring, South slope of Zekari pass, N41°49'23" E42°51'09", 2050m, 17.VII.2019, leg. G. Vinçon (1 male, OPC). Georgia, Imereti region, Racha range, Tkibuli, karst springs in forest below Nakerala Pass, N42°22.928' E43°01.070', 995m, 18.IX.2018, leg. D. Murányi *et al.* (1 male, 1 female, OPC).

**Diagnosis.** Having oblique vertical directed segment X with fused discernible epiproct and with membranous tergal strap this new species belongs to the *Rhyacophila tristis* species group; with its elongated pair of lateral lobes of the aedeagus, it belongs to the *Rhyacophila abchasica* species complex and most close to its sibling species *R. abchasica*, but differs by the enlarged and elongated segment X and the fused and spiny parameres.



**Figures 159–162.** *Rhyacophila zekara* Oláh & Vinçon, sp. nov. Holotype: 159 = male genitalia in left lateral view, 160 = segment X in dorsal view, 161 = segment X with epiproct and paraproct in caudal view, 162 = phallic organ in lateral view.

*Description.* Head, antennae, maxillary palps, legs and segmental sclerites dark brown. Forewing brown without any pattern in alcohol, forewing length 10 mm. Segment X is rather enlarged and elongated. Lateral shape of the harpago, the second segment of the gonopods with elongated ventral lobe. Phallic organ is particularly organised; phallobase together with the phallosome has a dorsal heavily sclerotized process with membranous tergal strap connecting segment X to the phallic organ; endotheca clearly membranous sunken or immersed into phallobase; aedeagus seems rather complex composed of a membranous ventral lobe, a pair of long lateral lobes with upward turning apex and a thin rod-like structure, probably the enforced, chitinised ductus ejaculatoricus difficult to discern because it is hidden between the less sclerotized large lateral lobes; the paramere is represented by the single fused structure composed of thin filaments of spines, a very unique modified process.

*Etymology.* *zekara*, named after the type locality.

#### *Rhyacophila aberrans* Martynov, 1913

*Material examined.* **Georgia**, Adjara, Mtirala NP, Chakvistavi 20km NE Batumi, brooks, 41°40.6'N, 41°52.4'E, 315m, 30.VI.2013, leg. P. Chvojka (1 female, NMPC); the same but stream, 41°40.5'N, 41°52.2'E, 320m, 30.VI.2013, leg. P. Chvojka (1 female, NMPC); the same but springs and brooks, 41°40.4'N, 41°51.2'E, 410m, 1.VII.2013, leg. P. Chvojka (3 males, 3 females, NMPC); Svanetia, Lengeri, stream 4.5km WSW of Mestia, 43°01.9'N, 42°40.6'E, 1415 m, 3.VII.2013, leg. P. Chvojka (2 males, NMPC); Svanetia, stream N of Mestia, 43°03.0'N, 42°43.1'E, 1510-1700m, 5.VII.2013, leg. P. Chvojka (1 female, NMPC). Georgia, Adjara region, brook and spring, < Goderdzi Pass, Dzindzitskali tributary N41°37'57" E42°32'38", 1900m, 16.VII.2019, leg. G. Vinçon (1 male, OPC). Georgia, Samtskhe-Javakheti region, 1km before Adjara border, torrent and cascade, < Goderdzi Pass, Dzindzitskali tributary N41°38'23" E42°34'56", 1680–800m, 16.VII.2019, leg. G. Vinçon (1 male,

OPC). Georgia, limit of Imereti and Samtskhe-Javakheti regions, Brook and spring, South slope of Zekari pass, N41°49'13" E42°52'07" 2000m, 17.VII.2019, leg. G. Vinçon (1 male, OPC). Georgia, Samtskhe-Javakheti region, 1 km before Adjaran border, torrent and cascade, < Goderdzi Pass, Dzindzitskali tributary, N41°38'23" E42°34'56", 1680–1800m, 16.VII.2019, leg. G. Vinçon (5 males, 3 females, OPC). Georgia, Adjara, Takidzeebi, Shavitketskali Stream, N41°39.516' E42°08.232', 445m, 25.IX.2019, leg. T. Kovács, P. Manko & D. Murányi (1 male, 1 female, OPC). Georgia, Samtskhe-Javakheti region, Epremovka, Kochki River below Madatapa Lake, N41°11.271' E43°45.033', 2115m, 14.VII.2019, leg. T. Kovács, D. Murányi & G. Vinçon (1 male, OPC).

### ***Rhyacophila spinulata* species complex**

*Rhyacophila spinulata* Martynov, 1913, a member of the *Rhyacophila tristis* species group, was described from a single male collected in a stream of low elevation near Batumi, Georgia. Later similar specimens were collected in three localities along the Black Sea coast in Turkey near Rize, Trabzon and Ordu (Sipahiler 1986b). Specimens of all the three localities have been identified as *R. spinulata*. The significant divergences detected between the specimens collected at the three localities in the shape of the complex of segment X, epiproct and paraproct, both in the dorsal and lateral profiles, as well as in the fine structure of the phallic organ have been qualified as variations of the same species (Sipahiler 1986b). Detailed examination of new taxa discovered in crossborder Georgia and described here demonstrates that the significant divergences detected in the dorsal, lateral and caudal profiles of the complex of segment X, epiproct and paraproct as well as in the structure of phallic organ are not variations of a widely distributed species. Rather they delineate new taxa of incipient phylogenetic species.

*Function of lumpers and splitters.* The taxa with putative wide distribution and high variability represent a typical epistemic model of lumpers who satisfy with this low-resolution power.

The lumper's attitude to find the most similar taxon among the described, known species by looking and searching similar characters states mostly by gross phenomics is only the very first phase of taxonomy in species determination. The second phase is the splitter's approach to search divergent character states by fine phenomics. The third phase relies on population samples to examine the stability or variability of the divergent state of diagnostic characters. The fourth phase is to search the potential speciation super trait.

*Rhyacophila spinulata* species represents a probably large species complex. It differs from the *Rhyacophila abchasica* species complex by the abbreviated pair of lateral lobes of the aedeagus. Here we describe three new species from Georgia and establish independent species status for the three taxa based on the published drawings. Based on these taxonomic actions the *R. spinulata* species complex contains eight species: *R. borcka* Sipahiler, 1996; *R. gouria* Oláh & Vinçon sp. nov., *R. mtirala* Oláh & Vinçon sp. nov., *R. ordua* Oláh sp. nov., *R. rizea* Oláh sp. nov., *R. sacokia* Oláh & Vinçon sp. nov., *R. spinulata* Martynov, 1913, *R. trabzona* Oláh sp. nov.

### ***Rhyacophila borcka* Sipahiler, 1996**

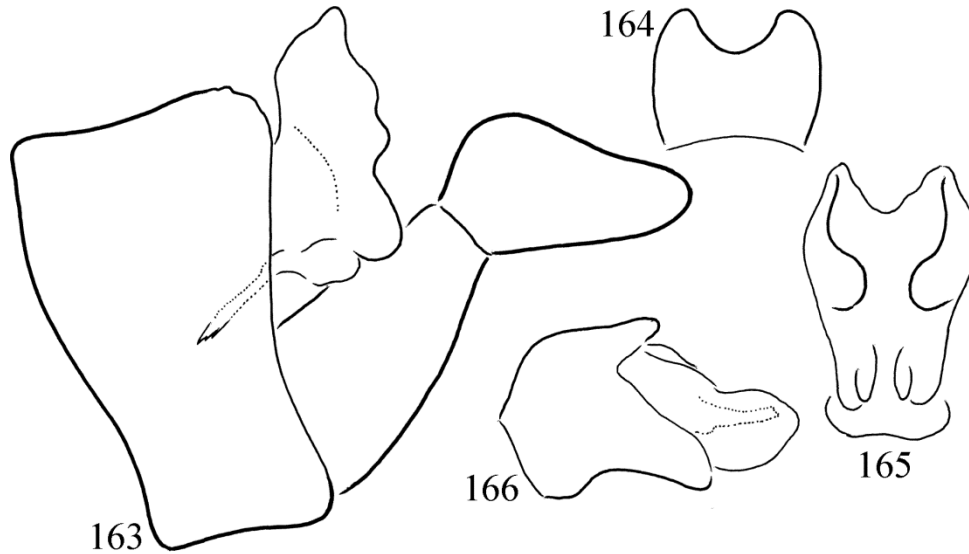
(Map 10)

*Rhyacophila borcka* Sipahiler, 1996a:1–3. "Holotype ♂, Turkey, Artvin, Borcka, 15 km SE of Camili (Macahel), in the direction of Gorgit yaylasi, 500 m, 28.IX.1994, Sipahiler leg." "R. borcka sp. nov. belongs to the *tristis*-group of the genus *Rhyacophila* and is well characterized by the shape of segment 10, the second segment of the inferior appendages, the aedeagus and the parameres."

### ***Rhyacophila gouria* Oláh & Vinçon, sp. nov.**

(Figures 163–166, Map 10, Photo 22)

*Material examined.* Holotype: **Georgia**, Gouria region, spring and two torrents with snow, tributary of Bzhuzhi River, 41°49'51"N, 42°09'



**Figures 163–166.** *Rhyacophila gouria* Oláh & Vinçon, sp. nov. Holotype: 163 = male genitalia in left lateral view, 164 = segment X in dorsal view, 165 = segment X with epiproct and paraproct in caudal view, 166 = phallic organ in lateral view.

05°E, 1750m, leg. G. Vinçon, 24.IX.2019 (1 male, OPC). Paratype: same as holotype (4 associated females, OPC).

**Diagnosis.** Having oblique vertical directed segment X with fused discernible epiproct and with membranous tergal strap this new species belongs to the *Rhyacophila tristis* species group; with its abbreviated pair of lateral lobes of the aedeagus, it belongs to the *Rhyacophila spinulata* species complex and most close to its sibling species *R. mtirala*, but differs by the lateral and caudal patterns of the complex of segment X, epiproct and paraproct.

**Description.** Head, antennae, maxillary palps, legs and segmental sclerites dark brown. Forewing brown without any pattern in alcohol, forewing length 8 mm. Segment X rather enlarged waving apical margin. Lateral shape of the harpago, the second segment of the gonopods with elongated ventral lobe. Phallic organ is particularly organised; phallobase together with the phallosome has a dorsal and ventral process with membranous tergal strap connecting segment X to the phallic organ; endotheca clearly membranous sunken or immersed into phallobase; aedeagus seems complex composed of a pair of blunt lateral

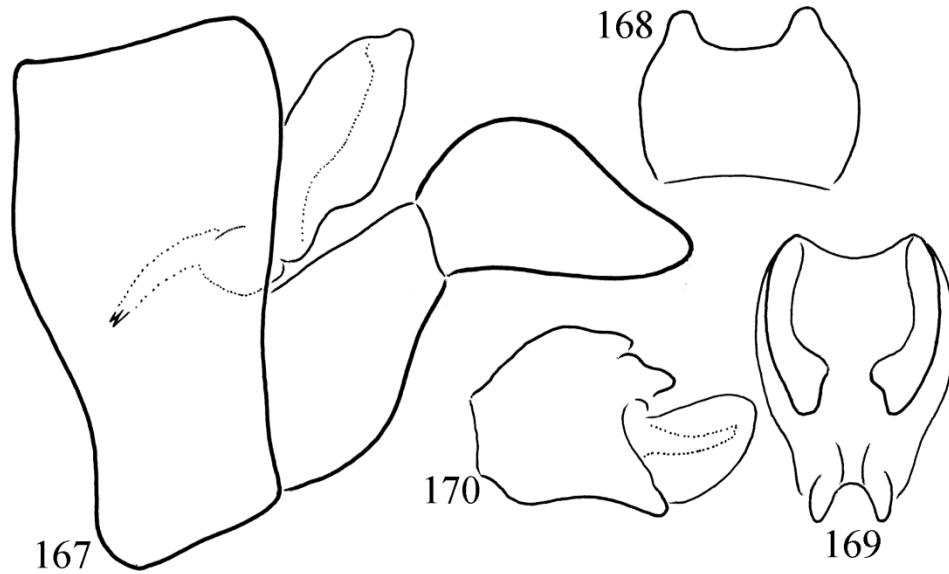
lobes less pigmented and a thin rod-like structure, probably the enforced, chitinised ductus ejaculatorius difficult to discern because it is hidden between the less sclerotized lateral lobes; parameres lacking.

**Etymology.** *gouria*, named after the type locality.

***Rhyacophila mtirala* Oláh & Vinçon sp. nov.**

(Figures 167–170, Map 10, Photo 28)

**Material examined.** Holotype: **Georgia**, Adjara region, Mtirala National Parc, above Chakvistavi, tributary of Sachokhia River, brook top of the cascade, 41°38'51" N, 41°52'56"E, 1200m, 25.IX.2019, leg. G. Vinçon (1 male, OPC). Paratype (3 males, 2 associated females, OPC). Georgia, Gouria region, brooklet, tributary of Bzhuzhi River, above Gomi, 41°52'25" N, 42°06'19"E, , 390m, 24.IX.2019, leg. G. Vinçon (1 male, OPC). Georgia, Gouria region, brooklet and cascade, tributary of Bzhuzhi River, 41°51'03" N, 42°06'55"E, 660m, 24.IX.2019, leg. G. Vinçon (1 male, OPC). Georgia, Gouria region, spring and brooks with snow, tributary of Bzhuzhi River, below Gomismta, 41°49'57" N, 42°09'21"E, 1910–1980



**Figures 167–170.** *Rhyacophila mtirala* Oláh & Vinçon, sp. nov. Holotype: 167 = male genitalia in left lateral view, 168 = segment X in dorsal view, 169 = segment X with epiproct and paraproct in caudal view, 170 = phallic organ in lateral view.

m, 24.IX.2019, leg. G. Vinçon (2 males, OPC). Georgia, Adjara, Kintrishi Nature Reserve, sidebrook of Cherulisghele Stream, N41°44.003' E42° 04.922', 1040m, 26.IX.2019, leg. T. Kovács, D. Murányi & G. Vinçon (1 male, OPC).

*Diagnosis.* Having oblique vertical directed segment X with fused discernible epiproct and with membranous tergal strap this new species belongs to the *Rhyacophila tristis* species group; with its abbreviated pair of lateral lobes of the aedeagus, it belongs to the *Rhyacophila spinulata* species complex and most close to its sibling species *R. gouria*, but differs by the lateral and caudal patterns of the complex of segment X, epiproct and paraproct.

*Description.* Head, antennae, maxillary palps, legs and segmental sclerites dark brown. Forewing brown without any pattern in alcohol, forewing length 9 mm. Segment X rather enlarged waving apical margin. Lateral shape of the harpago, the second segment of the gonopods with elongated ventral lobe. Phallic organ is particularly organised; phallobase together with the phallotheca has a short dorsal and ventral process with membranous tergal strap connecting segment X to the phallic organ; endotheca clearly

membranous sunken or immersed into phallobase; aedeagus seems complex composed of a pair of blunt lateral lobes less pigmented and a thin rod-like structure, probably the enforced, chitinised ductus ejaculatoricus difficult to discern because it is hidden between the less sclerotized lateral lobes; parameres lacking.

*Etymology.* *mtirala*, named after the type locality.

***Rhyacophila ordua* Oláh, sp. nov.**

(Map 10)

*Rhyacophila spinulata* Martynov, 1913: Sipahiler, 1986b:527–528. Described as variations of the male genitalia of *Rhyacophila spinulata* Martynov. Misidentification!

*Material examined.* Holotype: **Turkey**, Ordu, Yukaritepe köyü, 21–27.VIII.1982, leg. F. Sipahiler (1 male, drawn specimen, SPC). Paratypes: same as holotype (2 males, SPC).

*Description and diagnosis.* (Figures: Sipahiler 1986b: figure 2c,d). Having oblique vertical directed segment X with fused discernible epiproct and with membranous tergal strap this new

species belongs to the *Rhyacophila tristis* species group; with its abbreviated pair of lateral lobes of the aedeagus, it belongs to the *Rhyacophila spinulata* species complex and most close to its sibling species *R. trabzona* sp. nov., but differs by the dorsal and lateral patterns of the complex of segment X, epiproct and paraproct as well as by the lateral structure of the phallic organ.

*Etymology.* *ordua*, named after the type locality.

***Rhyacophila rizea* Oláh, sp. nov.**

(Map 10)

*Rhyacophila spinulata* Martynov, 1913: Sipahiler, 1986b:527–528. Described as variations of the male genitalia of *Rhyacophila spinulata* Martynov. Misidentification!

*Material examined.* Holotype: **Turkey**, Rize, Çamlıhemşin, Aşağı Vice Mahallesi, 780m, 16.VII.1984, leg. F. Sipahiler (5 males, 1 female; SPC).

*Description and diagnosis.* (Figures: Sipahiler 1986b: figure 2e,f). Having oblique vertical directed segment X with fused discernible epiproct this new species belongs to the *Rhyacophila tristis* species group; with its abbreviated pair of lateral lobes of the aedeagus belongs to the *Rhyacophila spinulata* species complex and most close to its sibling species *R. mtirala* sp. nov., but differs by the lateral patterns of the complex of segment X, epiproct and paraproct as well as by the lateral structure of the phallic organ.

*Etymology.* *rizea*, named after the type locality.

***Rhyacophila sacokia* Oláh & Vinçon, sp. nov.**

(Figures 171–174, Map 10, Photo 28)

*Material examined.* Holotype: **Georgia**, Adjara region, Mtirala National Parc, above Chakvistavi, tributary of Sachokhia River, brook top of the cascade, 41°38'51" N, 41°52'56"E, 1200m,

25.IX.2019, leg. G. Vinçon (1 male, OPC). Paratypes: Georgia, Gouria region, spring and brooks with snow, tributary of Bzhuzhi River, below Gomismta, 41°49'57" N, 42°09'21"E, 1910–1980m, 24.IX.2019, leg. G. Vinçon (4 males, 1 female, OPC).

*Diagnosis.* Having oblique vertical directed segment X with fused discernible epiproct and with membranous tergal strap this new species belongs to the *Rhyacophila tristis* species group; with its abbreviated pair of lateral lobes of the aedeagus, it belongs to the *Rhyacophila spinulata* species complex and most close to its sibling species *R. borcka* Sipahiler, but differs by the lateral and caudal patterns of the complex of segment X, epiproct and paraproct.

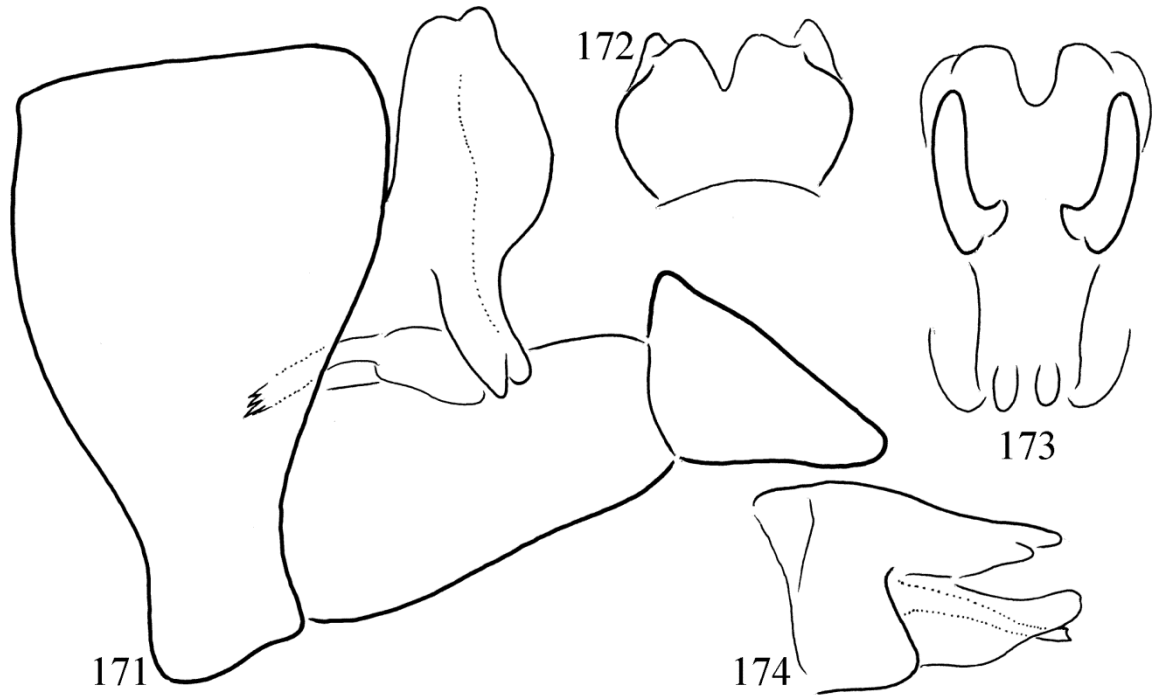
*Description.* Head, antennae, maxillary palps, legs and segmental sclerites dark brown. Forewing brown without any pattern in alcohol, forewing length 9 mm (paratype 13 mm). Segment X rather enlarged with bellied apical margin. Lateral shape of the harpago, the second segment of the gonopods with elongated ventral lobe. Phallic organ is particularly organised; phallobase together with the phallosome has a long dorsal process and short ventral lobe with membranous tergal strap connecting segment X to the phallic organ; endotheca clearly membranous sunken or immersed into phallobase; aedeagus seems complex composed of a pair of narrowing lateral lobes less pigmented and a thin rod-like structure, probably the enforced, chitinised ductus ejaculatoricus difficult to discern because it is hidden between the less sclerotized lateral lobes; parameres lacking.

*Etymology.* *sacokia*, named after the type locality.

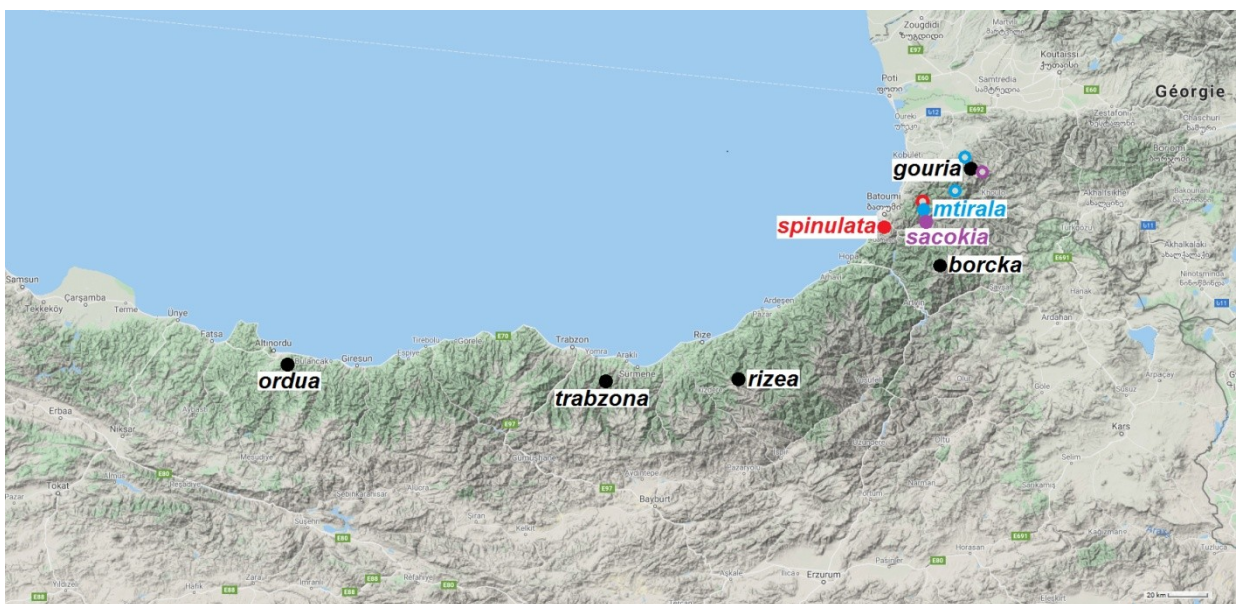
***Rhyacophila spinulata* Martynov, 1913**

(Map 10)

*Material examined.* **Georgia**, Adjara, Mtirala NP, Chakvistavi 20 km NE Batumi, brooks, 41°40.6'N, 41°52.4'E, 315 m, 30.VI.2013, leg.



**Figures 171–174.** *Rhyacophila sacokia* Oláh & Vinçon, sp. nov. Holotype: 171 = male genitalia in left lateral view, 172 = segment X in dorsal view, 173 = segment X with epiproct and paraproct in caudal view, 174 = phallic organ in lateral view.



Map 10. Distribution of *Rhyacophila spinulata* species complex (full circles represent the type localities)



P. Chvojka (6 males, NMPC); the same but springs and brooks, 41°40.4'N, 41°51.2'E, 410 m, 1.VII.2013, leg. P. Chvojka (6 males, 2 females, NMPC).

***Rhyacophila trabzona* Oláh, sp. nov.**

(Map 10)

*Rhyacophila spinulata* Martynov, 1913: Sipahiler, 1986b:527–528. Described as variations of the male genitalia of *Rhyacophila spinulata* Martynov. Misidentification!

**Material examined.** Holotype: **Turkey**, Trabzon, Sürmene'nin 35 km güneyi, 19.VIII.1983, leg. F. Sipahiler (1 male, SPC).

**Description and diagnosis.** (Figures: Sipahiler 1986b: figure 2a,b). Having oblique vertical directed segment X with fused discernible epiproct and with membranous tergal strap this new species belongs to the *Rhyacophila tristis* species group; with its abbreviated pair of lateral lobes of the aedeagus, it belongs to the *Rhyacophila spinulata* species complex and most close to its sibling species *R. ordua* sp. nov., but differs by the dorsal and lateral patterns of the complex of segment X, epiproct and paraprot as well as by the lateral structure of the phallic organ.

**Etymology.** *trabzona*, named after the type locality.

***Rhyacophila glareosa* species group**

***Rhyacophila clavalis* Martynov, 1913**

**Material examined.** **Georgia**, Adjara, Khabelashvilebi, Bird Spring, above (N of) the village, 2010m, N41°45.063' E42°11.313', 28.IX.2019, leg. T. Kovács & D. Murányi (1 male, 1 female, OPC).

***Rhyacophila vulgaris* species group**

***Rhyacophila armeniaca* Guerin-Meneville, 1844**

**Material examined.** **Georgia**, Mtskheta-Mtianeti region, Gveleti, Tibistskali Stream above its

mouth to Terek River, N42°42.605' E44° 37.597', 1440m, 12.VII.2019, leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (1 male, OPC).

***Rhyacophila fasciata* species complex**

*Rhyacophila fasciata* species complex belongs to the *Rhyacophila vulgaris* species group in the *Rhyacophila vulgaris* branch (Schmid 1970). Based on paramere organisation and on the character state of geographical distribution we have delineated three lineages in the complex:

(1) *Rhyacophila fasciata* lineage has large spines additional to the complex specific microtrichia present on the parameres; the longitudinal/axial band of the microtrichia located laterad, narrowing apicad and delineated ventrad partially by a distinct ridge. This lineage is distributed mostly in Europe. Its recent revision produced eleven new species, increasing the total number of the lineage up to fifteen species (Oláh et al. 2020).

(2) *Rhyacophila aliena* lineage has broad parameres without large spines and with lateral location of microtrichial band; seldom the band of microtrichia visible fully or partially inverted mesad; the inversion of microtrichial surface could be the result of intense copulatory processes or genetic disorders. This lineage is distributed from Turkey through the Caucasus to Northern Iran and represented by two known species and here we describe two new species.

(3) *Rhyacophila mysica* lineage has slender parameres without large spines and with mesal location of longitudinal band of microtrichia; microtrichia could be almost indiscernible; this lineage is distributed from Albania to Pakistan.

Recent studies on the fine phenomics of the adaptive paramere supported by additional male and female morphological characters have reinstated the species status of taxa reduced previously to subspecies status by Malicky & Sipahiler (1993) in the *Rhyacophila fasciata* species complex (Walladolid et al. 2018, 2019): *R.*

*denticulata* McLachlan, *R. sociata* Navás *R. kykladica* Malicky & Sipahiler.

Here we rediagnose the nominate species *Rhyacophila aliena* Martynov, 1916; reconfirm *Rhyacophila thalysica* Martynov, a species described by Martynov (1938) in his last taxonomic paper on Trichoptera, but remained without any further record or note; and describe two new species from the *Rhyacophila aliena* lineage and one new species from the *Rhyacophila mysica* lineage.

Species delineation in the species complex is based on five male genital structures. (1) The dorsal shape or dorsal profile of the apicodorsal process on segment IX. (2) Lateral shape of the harpago, the second segment of the gonopods. (3) The lateral profile of the aedeagus with its mesal and ventral processes. (4) The ventral shape of the ventral process on the aedeagus. (5) The lateral profile of the left paramere.

Here we present five species from the *Rhyacophila fasciata* species complex. Four species from the *R. aliena* lineage: *R. aliena* Martynov, *R. iranica* sp. nov., *R. kora* sp. nov., *R. talyshica* Martynov, and one species from the *R. mysica* lineage: *R. pakistanica* sp. nov.

***Rhyacophila aliena* Martynov, 1916 stat. rest.**

(Figures 175–180, Map 11)

*Rhyacophila aliena* Martynov, 1916b:187–198. “Russia: Urup, prov. Kuban, 22.IX.1912.” Belongs to the *R. fasciata* species group composed of three European species: *R. denticulata*, *R. fasciata*, *R. septentrionis*, and differs mostly by the narrow dorsoapical process of segment IX and by the paramere (titillator) organisation.

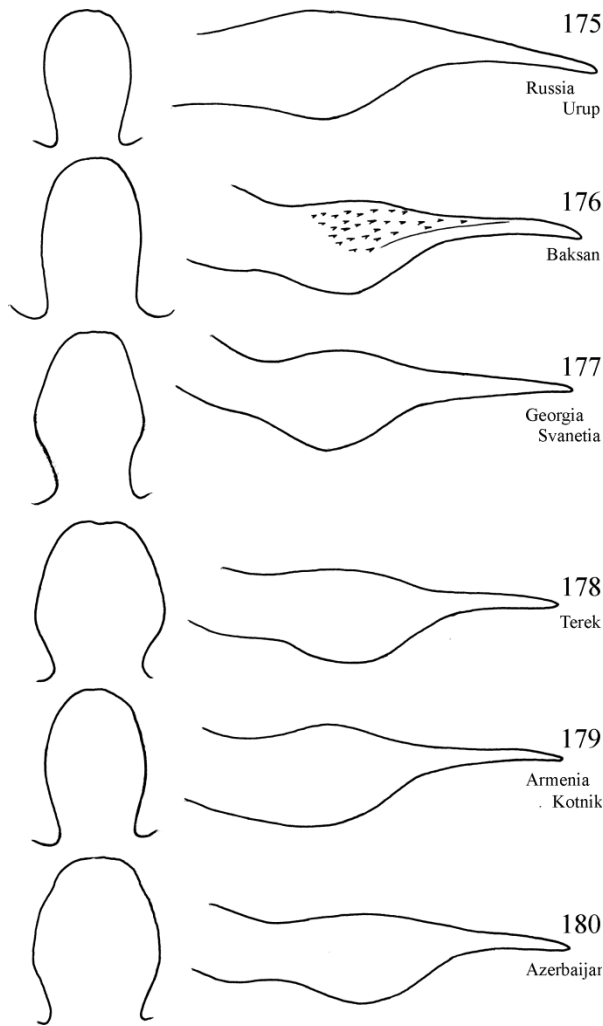
*Rhyacophila aliena*: Martynov 1926:24. Tens of specimens have been collected in 20.X.1925 at River Kambejevka near Vladikavkaz. “Until now only the single specimen (holotype) of this species was collected along Urup River, Kuban Oblast. It seems this is a late flying species.”

*Rhyacophila aliena*: Martynov 1934:45–47. “Found at River Urup, Kuban Oblast and along River Kambejevka near Vladikavkaz.” “Titillator (para-

mere) with thin and pointed apices but strongly broadened along basal half.”

*Rhyacophila fasciata aliena* Martynov, 1916: Malicky & Sipahiler 1993:461–462. The species status was reduced to subspecies status in the *Rhyacophila fasciata* subspecies complex together with *R. fasciata denticulata* and three new subspecies: *R. fasciata mysica*, *R. fasciata kykladica*, *R. fasciata libanica* established.

*Material examined. Armenia*, Kotnik, Eilar, 1.VII.1926, leg. Schelkovnikov (1 male, OPC). **Azerbaijan**, Gədəbəy district, Gədəbəy, big stream S of the village, N40°27.218' E45°43.045', 1510m, 1.X.2019, leg. T. Kovács, P. Manko, D. Murányi (2 males, 1 female, OPC). Azerbaijan: brook, tributary of Balakən River, Balakən-Mahamalar, 41°44'13"N, 46°26'14"E, 465 m, 9.V.2019, leg. D. Murányi & J. Oboňa (1female, NMPC). **Georgia**, Svanetia, stream N of Mestia, N43°03.0' E42°43.1', 1510-1700 m, 5.VII.2013, leg P. Chvojka (1 male, NMPC). Georgia, Mingrelia and High Svanetia region, Khaishura River tributary, same torrent above Kveda Vedi until its spring, 42°54'47" N, 42°11'05"E, 1300–1500m, 22.IX.2019, leg. G. Vinçon (1 female, OPC). Georgia, Mtskheta-Mtianeti region, Sno Castle, small river with dense riparian vegetation, tributary of Snostskali River, 42°36'18"N, 44°38'17"E, 1780m, 1.X.2019, leg. G. Vinçon (1 male, OPC). Georgia, Mtskheta-Mtianeti region, below Juta, Kora River, 42°33'52"N, 44°42'27"E, 1860m, 29.IX.2019, leg. G. Vinçon (2 males, 2 females, OPC). Georgia, Mtskheta-Mtianeti region, above Juta, spring and upper section of the Chaukhistskali Valley, 42°33'14"N, 44°46'22"E, 2900–2980m, 30.IX.2019, leg. G. Vinçon (2 males, OPC). Georgia, Mtskheta-Mtianeti region, above Juta, Chaukhistskali River and small tributaries, 42°34'04"N, 44°45'28"E, 2400m, 30.IX.2019, leg. G. Vinçon (2 males, OPC). Georgia, Mtskheta-Mtianeti region, Dariali, lateral small spring in the Khde River valley above the dam, 42°43'54"N, 44°38'40"E, 1610m, 2.X.2019, leg. G. Vinçon (2 males, 3 females, OPC). Georgia, Mtskheta-Mtianeti region, Tibistskali Stream above its mouth to Terek River, 42°42'36N, 44°37'36"E, 1440m, 2.X.2019, leg. G. Vinçon (4 males, OPC). **Russia**, Central Caucasus, Northern



**Figures 175–180.** *Rhyacophila aliena* Martynov, 1916. Dorsal process of segment IX and the lateral profile of left paramere in populations from Armenia, Azerbaijan, Georgia and from nearby locus typicus in Russia.

slopes, Baksan River basin, nameless brook in the locality of Baidaevych, 1 km upstream ravine, 2300 m, 4.X.1974, leg. W. Joost (3 males, OPC).

*Re-diagnosis.* We have specimens from the Baksan River Basin of the northern slopes of the West-Central Caucasus, Russia nearby the locus typicus of the Kuban River Basin. Moreover we have examined specimens with similar paramere profile and dorsoapical process from Armenia, Azerbaijan and Georgia. *R. aliena* is most close to *R. iranica* sp. nov. but differs by the elongated dorsoapical process as was already recognised in

Schmid (1959) paper comparing Iranian specimens to the original drawings of Martynov. Specimens collected in various locations in north-eastern Turkey and determined as *R. aliena* have been recorded closer to Caucasian than to Iranian specimens (Sipahiler 2018a). Here we reinstate the species status of *Rhyacophila aliena* Martynov, 1916.

The three males collected from Baksan River Basin have typical elongated dorsoapical process on segment IX, and the character of process elongation remains present in specimens from Armenia, Azerbaijan and Georgia.

***Rhyacophila iranica* Oláh, sp. nov.**

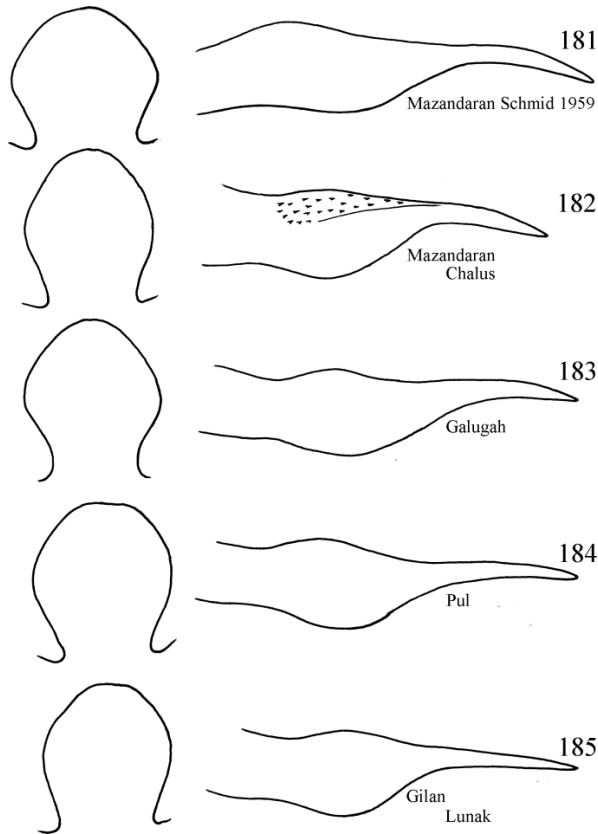
(Figures 181–185, Map 11, Photo 52)

*Rhyacophila aliena* Martynov, 1916: Schmid 1959: 409. Collected and examined several specimens from Central Elburz Mts in Northern Iran where it is very common and abundant along streams and rivers. “*Rhyacophila aliena* est très voisin de *septentrionis* McL. Mes insectes montrent de nombreuses et légères variations dans la forme de tous les appendices génitaux.” Misidentification!

*Rhyacophila aliena* Martynov, 1916: Schmid 1970: 119. Examining and drawing specimens collected from the Central Elburz Mts. (near to the Talish Mts. and not from Central Iran as suggested by Sipahiler (2018). Misidentification.

*Material examined.* Holotype: **Iran**, N. Iran, Mazandaran Province, stream 10 km S Galugah, 36°41.1’N 53°46.3’E, 550m, 29.V.2006, leg. P. Chvojka (1 male, NMPC). Paratypes: Iran, N. Iran, Mazandaran Province, stream 6 km W Pul, 36°25.5’N 51°30.5’E, 1030m, 1.VI.2006, at light, leg. P. Chvojka (1 male, 1 female, NMPC). Iran, N. Iran, 44 km S Chalus, 2.VII.1970, leg. SSE (1 male, OPC). Iran, N. Iran, Gilan Province, stream near Lunak, S Lahijan, 37°01.8’N 49°53.5’E, 320m, 3.VI.2006, at light, leg. P. Chvojka & Hájek (2 males, 1 female, OPC).

*Diagnosis.* Having broad parameres without large spines *R. iranica* sp. nov. belongs to the *Rhyacophila aliena* lineage, most close to *R.*



**Figures 181–185.** *Rhyacophila iranica* Oláh sp. nov. Dorsal process of segment IX and the lateral profile of left paramere in Iranian populations. Holotype: 183 = Iran, Mazandaran, Galugah.

*aliena*, but differs by having dorsoapical process of segment IX broad, abbreviated.

**Description.** Head, antennae, maxillary palps, legs and segmental sclerites medium brown. Forewing brown mottled with pale spotted reticulation, very faded in alcohol, forewing length 14 mm. Dorsal shape of the apicodorsal process of segment IX almost broad, abbreviated. Lateral shape of the harpago, the second segment of the gonopods with elongated ventral lobe. The lateral profile of the aedeagus with horizontal dorsal process. The ventral shape of the ventral process on the aedeagus quadrangular with rounded apex. The lateral profile of the left paramere is almost similar to the lateral profile of *R. aliena*.

**Etymology.** Named after the country of the type locality.

***Rhyacophila kora* Oláh, sp. nov.**

(Figures 186–192, Map 11)

**Material examined.** Holotype: **Turkey**, Artvin Province, Jusufeli District, Altiparmak, NW Yusufeli, stream above village, 7.VII.1993, leg P. Chvojka (1 male, NMPC). Allotype: same as holotype (1 female, NMPC).

**Diagnosis.** Having broad parameres without large spines, it belongs to the *Rhyacophila aliena* lineage, most close to *R. talyshica* Martynov, but differs by having dorsoapical process of segment IX elongated, not abbreviated; ventral lobe of the aedeagus short quadrangular, not long; lateral profile of the left paramere with very pronounced almost regular circle shaped middle extension, but asymmetric having the ventral extension more produced.

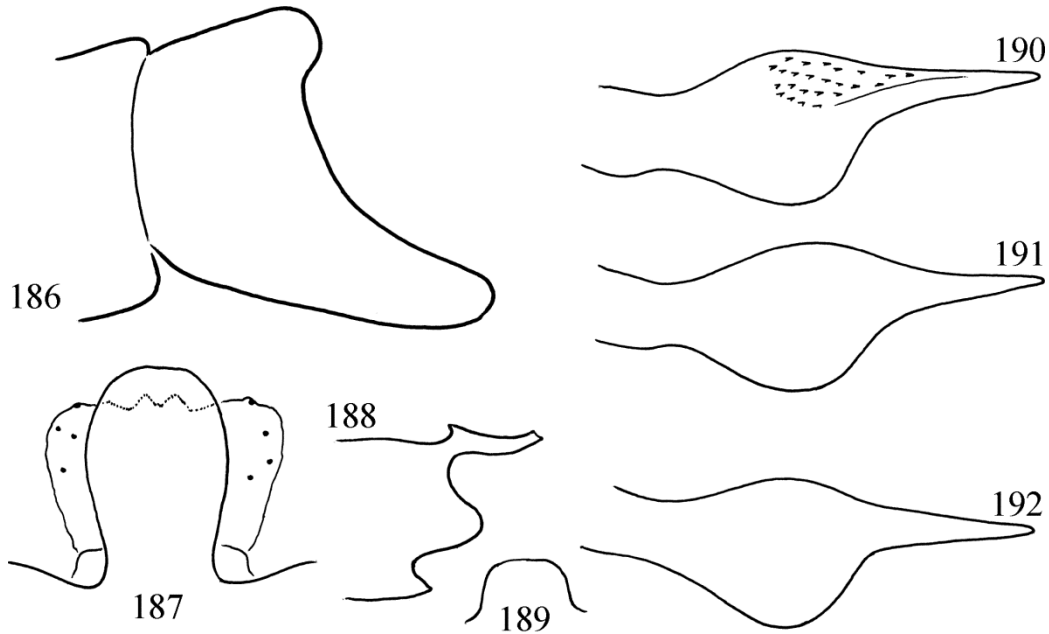
**Description.** Head, antennae, maxillary palps, legs and segmental sclerites medium brown. Forewing brown mottled with pale spotted reticulation, very faded in alcohol, forewing length 13 mm. Dorsal shape of the apicodorsal process of segment IX almost elongated. Lateral shape of the harpago, the second segment of the gonopods with elongated ventral lobe. The lateral profile of the aedeagus with horizontal dorsal process. The ventral shape of the ventral process on the aedeagus short quadrangular. The lateral profile of the left paramere is characterized with an almost circular, but asymmetric middle region.

**Etymology.** *kora*, coined from “kör” circle in Hungarian, refers to the almost regular circle shape of the middle portion of the parameres.

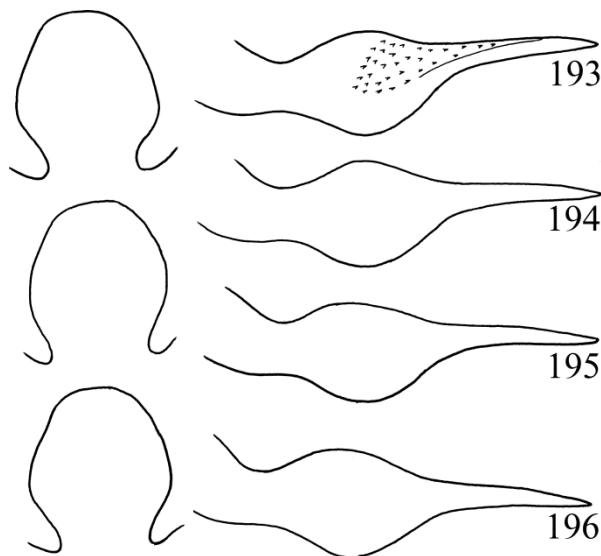
***Rhyacophila talyshica* Martynov, 1938**

(Figures 193–196, Map 11)

*Rhyacophila talyshica* Martynov 1938:65, 72. “1 ♂. Kys-urdu, 2200’, Soowant, Talysh, 8.VIII.1932. D. Znoiko.” “*Rhyacophila talyshica* n. sp. is closely allied to *Rhyacophila septentrionis* McLachl., but distinct.” In Russian only “*R. denticulata* McLach and *R. fasciata* Hagen also belong to this group.” Described from the Talish Mts. and Martynov



**Figures 186–192.** *Rhyacophila kora* Oláh, sp. nov. Holotype: 186 = left harpago in lateral view, 187 = dorsal process of segment IX in dorsal view, 188 = aedeagus in lateral view, 189 = ventral process of the aedeagus in ventral view, 190 = left paramere in lateral view, 191–192 = lateral profile of of left parameres redrawn.



**Figures 193–196.** *Rhyacophila talyshica* Martynov, 1938. Dorsal process of segment X and the lateral profile of left paramere in population from Iran, nearby locus typicus.

being very accurate and an excellent drawer, has not compared it to his own species *Rhyacophila aliena* described by him in 1916 from the foothills of the northern slope of West Caucasus.

*Material examined.* **Iran**, Gilan Province, Talesh Mts., Masula River, 4.VII.1990, light leg. J. Oláh (4 males, OPC).

*Re-diagnosis.* *Rhyacophila talyshica* was described by Martynov, 1938 in his last caddisfly paper on the Trichoptera of Nachitschewan ASSR and neighbouring districts and published in local Azerbaijan journal of the SSSR Academy of Sciences. We have found no any further information of this species. It is not listed even in the Trichoptera World Checklist Database. The single male type has been lost in the Second World War. In 1990 we have collected four males at light in the Iranian part of the Thalesh Mts.

Unfortunately Martynov has compared his new species, *R. talyshica* to *R. septentrionis* described from England by McLachlan and not to his *R. aliena* species described earlier in 1916 from the northern slopes of West Caucasus. However *R. talyshica* is close to *R. aliena* and *R. iranica* sp. nov. representing an incipient sibling species in the *R. aliena* lineage of the *R. fasciata* species

complex. Apicodorsal process of segment IX short subpentagonal. The lateral profile of the left paramere rather stable at the examined four specimens and differs from the parameres of *R. aliena* described by the same author. The middle almost circular middle extension on the parameres is rather symmetrical. The middle broadening is not circular and asymmetrical, extended more ventrad.

***Rhyacophila pakistanica* Oláh, sp. nov.**

(Figures 197–206)

*Rhyacophila fasciata* Hagen, 1859: Oláh 2010: 85. 14 specimens collected in Kashmir, Pakistan. Misidentification!

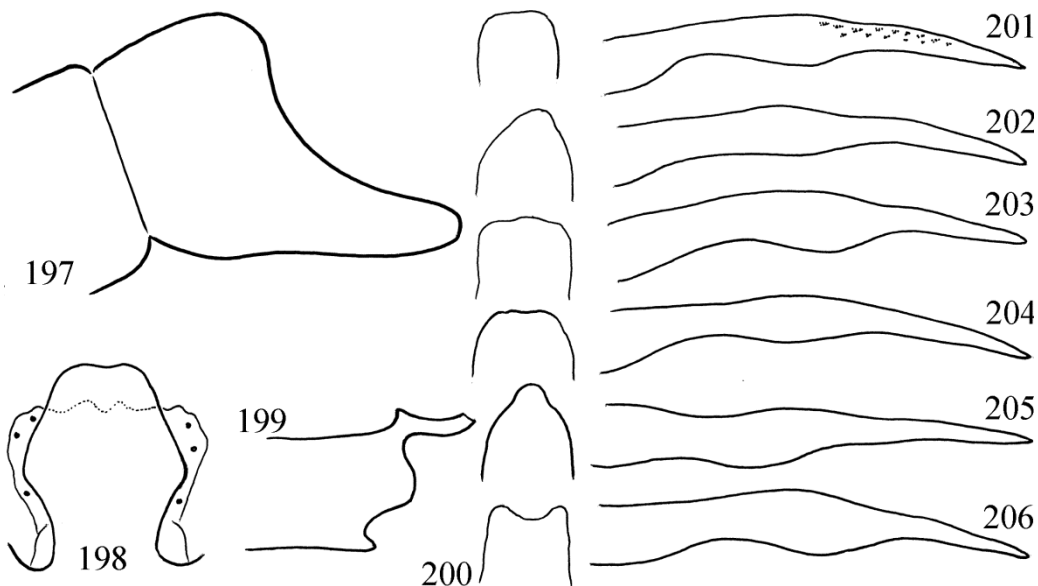
**Material examined.** Holotype: **Pakistan**, Kashmir, Bubin, lower area, 17.VIII.2001, leg. B. Benedek & G. Ronkay (1 male, OPC). Paratypes: same as holotype (9 males, OPC; 3 males, NMPC).

**Diagnosis.** Having slender parameres without large spines and with mesal location of longitudinal band of microtrichia *R. pakistanica* sp. nov. belongs to the *Rhyacophila mysica* lineage,

most close to *R. isparta* Sipahiler, but differs by having dorsoapical process of segment IX pentagonal, not elongated parallel-sided; harpago with concave and not with straight apical margin; ventral lobe of the aedeagus differently shaped; lateral profile of the left paramere with broad basal region, not narrow slim.

**Description.** Head, antennae, maxillary palps, legs and segmental sclerites medium brown. Forewing brown mottled with pale spotted reticulation, very faded in alcohol, forewing length 14 mm. Dorsal shape of the apicodorsal process of segment IX almost regular subpentagonal. Lateral shape of the harpago, the second segment of the gonopods with elongated ventral lobe. The lateral profile of the aedeagus with upward shifted dorsal process. The ventral shape of the ventral process on the aedeagus highly variable from truncate to tapering or even to bilobed. The lateral profile of the left paramere is slender with slight middle dilatation; the longitudinal band of the short microtrichia located mesad.

**Etymology.** Named after the country of the type locality.



**Figures 197–206.** *Rhyacophila pakistanica* Oláh, sp. nov. Holotype: 197 = left harpago in lateral view, 198 = dorsal process of segment IX in dorsal view, 199 = aedeagus in lateral view, 200 = ventral process of the aedeagus in ventral view, variation within population, 201–206 = left paramere of paratypes in lateral view, variation within population. Holotype: 201 = Pakistan.



Map 11. Distribution of *Rhyacophila aliena* species complex (full circles represent the type localities)

***Rhyacophila forcipulata* Martynov, 1926**

*Material examined.* **Georgia**, Mingrelia and High Svanetia region, Ingouri dam tributary, steep mossy brook, 42°51'31" N, 42°02'01"E, 550m, 22.IX.2019, leg. G. Vinçon (1 male, OPC). Georgia, Samtskhe-Javakheti region, Utkisubani, waterfall towards Goderdzi Pass, N41°38.345' E42°34.976', 1660m, 27.IX.2019 leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (1 male, OPC).

***Rhyacophila kumanskii* Spuris, 1988**

*Material examined.* **Georgia**, Adjara, downflow of the Mtsvane Tba (Green Lake), N of Goderdzi Pass, N41°40'41.49" E42°29'54.69", 2055m, leg. T. Kovács, 27.IX.2019 (1 male, OPC). Georgia, Guria region, spring and two torrents with snow, tributary of Bzhuzhi River, 41°49'51" N, 42°09'05"E, 1750m, leg. G. Vinçon, 24.IX.2019 (1 male, OPC). Georgia,

Imereti region, steep brook and spring above the road, north slope of Zekari pass, Kershaveti tributary, 41°50'45"N, 42°48'31"E, 2150–2200m, 28.IX.2019, leg. G. Vinçon (1 male, OPC). Georgia, Imereti region, steep brook and spring, north slope of Zekari pass, below Didmaghala Pic, Tsablarastskali tributary, 41°50'55"N, 42°47'43"E, 2080m, 28.IX.2019, leg. G. Vinçon (1 male, 1 female, OPC). Georgia, Samtskhe-Javakheti region, brooklet in grassy land, tributary of Borjomula River, above Bakuriani, 41°42'34"N, 43°30'28"E, 2070m, 29.IX.2019, leg. G. Vinçon (1 male, OPC). Georgia, Samtskhe-Javakheti region, spring and brooklet in grassy land, tributary of Borjomula River, above Bakuriani, 41°41'35"N, 43°31'02"E, 2270-2350m, 29.IX.2019, leg. G. Vinçon (5 males, OPC). Georgia, Samtskhe-Javakheti region, brooklet in forest with a lot of aquatic vegetation, tributary of Borjomula River, above Bakuriani, 41°43'56"N, 43°30'26"E, 1780m, 29.IX.2019, leg. G. Vinçon (3 males, 4 females, OPC). Georgia, Samtskhe-Javakheti re-

gion, Utkisubani, waterfall towards Goderdzi Pass, N41°38.345' E42°34.976', 1660m, 27.IX.2019 leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (1 male, OPC).

***Rhyacophila nubila* (Zetterstedt, 1840)**

*Material examined.* **Armenia**, Areni env., Noravank monastery, rocky steppe, 39°41'44"N, 45°12'52"E, 1330m, 2.VI.2017 (2 males, 3 females, NMPC), the same but 21.IX.2018 (1 male, NMPC); Arevik National Park, 2.3 km NW of Aygedzor, Lichtkvaz, mountain steppe, rocks, 38°59'25"N, 46°11'09"E, 1355 m, 4.VI.2017 (2 males, 3 females, NMPC); Arevik National Park, 3.2 km NE of Meghri, Artsvakar, gorge, rocky steppe, 38°55'15"N, 46°16'17"E, 750 m, 6.-7.VI.2017 (1 male, 1 female, NMPC); Arevik National Park, 3 km NW of Meghri, Lehvaz env., rocky steppe, gorge, 38°54'59"N, 46°13'12"E, 844 m, 24.IX.2018 (4 males, NMPC); Azat Reservoir, 13 km SE of Yerevan, Hatsavan env., steppe, 40°04'36"N, 44°36'47"E, 1071m, 1.X.2018 (1 female, NMPC); leg. all Jan Šumpich. **Azerbaijan**, Goygol District, Togana Village, VII.2019, leg. I. Kerimova (3 males, OPC). **Georgia**, Adjara, Kintrishi River and its sidespring at Varjanauli Bridge, N41°47.324' E41°57.632', 215m, 24.IX.2019, leg. T. Kovács & D. Murányi (1 male, OPC).

***Rhyacophila subovata* Martynov, 1913**

*Material examined.* **Georgia**, Svanetia, brook, left tributary of Mulkhura riv. SE of Mestia, 43°02.4'N, 42°45.5'E, 1490 m, 5.VII.2013, leg. P. Chvojka (1 male, NMPC); the same but 43°02.5'N, 42°45.8'E, 1500 m, 5.VII.2013, leg. P. Chvojka (1 male, NMPC); Svanetia, stream N of Mestia, 43°03.0'N, 42°43.1'E, 1510–1700 m, 5.VII.2013, leg. P. Chvojka (3 males, NMPC); tributary of White Aragvi River, Zemo Mleta SE of Gudauri, 42°26'11"N, 44°29'41"E, 1560 m, 28.IV.2019, leg. D. Murányi & J. Oboňa (1 male, NMPC). **Georgia**, limit of Imereti and Samtskhe-Javakheti regions, Brook and spring, South slope of Zekari pass, N41°49'13" E42°52'07" 2000m, 17.VII.2019, leg. G. Vinçon (1 male, OPC).

Mtskheta-Mtianeti region, Juta, Jutistskali River below (W of) the village, N42°33.43' E44°42.36', 1870m, 11.VII.2019, leg. G. Vinçon (1 male, OPC). **Georgia**, Mtskheta-Mtianeti region, Dariali, forest brook in the Khde River valley N42°43.904' E44°38.676', 1590m, 12.VII.2019, leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (4 males, OPC). **Georgia**, Samtskhe-Javakheti region, 1 km before Adjaran border, torrent and cascade, < Goderdzi Pass, Dzindzitskali tributary, N41°38'23" E42°34'56", 1680–1800m, 16.VII.2019, leg. G. Vinçon (1 male, OPC).

***Rhyacophila obscura* species group**

***Rhyacophila obscura* Martynov, 1927**

*Material examined.* **Kazakhstan**, Almaty, Talgar National Park, mountain stream, N43°13' 52" E77°14'03", 160m, 4–6.VI.2019 (1 male, OPC).

***Rhyacophila stigmatica* species group**

***Rhyacophila camiliensis* Sipahiler, 2013**

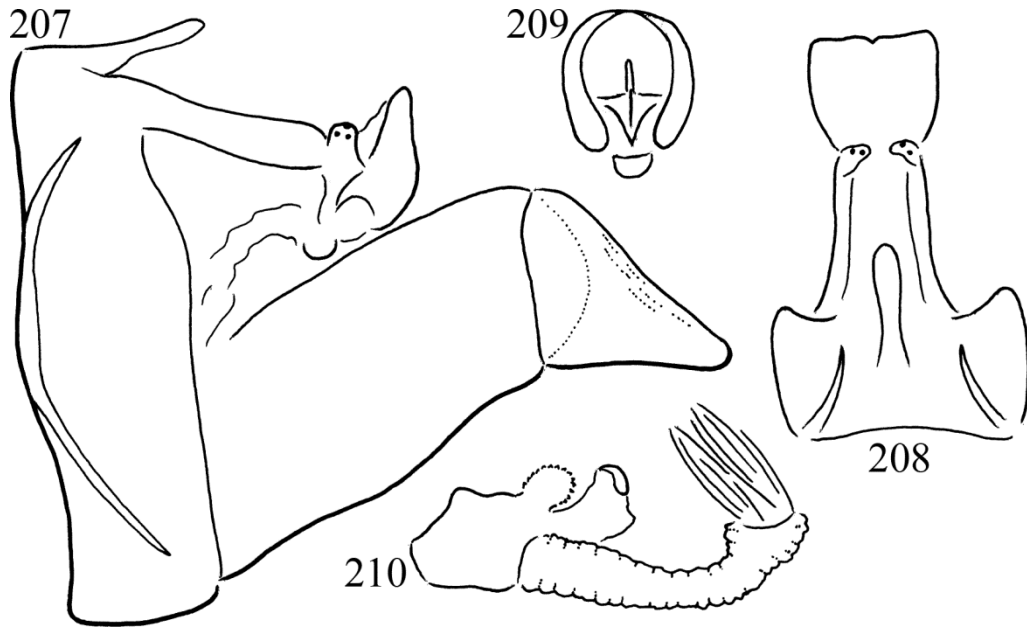
*Material examined.* **Georgia**, Adjara, Mtirala NP, Chakvistavi 20 km NE Batumi, springs and brooks, 41°40.4'N, 41°51.2'E, 410 m, 1.VII.2013, leg. P. Chvojka (1 male, NMPC).

***Rhyacophila kimara* Oláh & Vinçon, sp. nov.**

(Figures 207–210, Photo 28)

*Material examined.* Holotype: **Georgia**, Adjara region, Mtirala National Parc, above Chakvistavi, tributary of Sachokhia River, brook top of the cascade, 41°38'51" N, 41°52'56"E, 1200m, 25.IX.2019, leg. G. Vinçon (1 male, OPC). Paratype: same as holotype (1 male, OPC). **Georgia**, Gouria region, brooklet and cascade, tributary of Bzhuzhi River, 41°51'03" N, 42°06'55"E, 660m, 24.IX.2019, leg. G. Vinçon (1 male, OPC). **Georgia**, Adjara, Khichauri, Chvanistskali River at the bridge, N41°38.715' E42°07.990', 350m, 25.IX.2019, leg. T. Kovács, P. Manko & D. Murányi (3 males, OPC). **Georgia**, Adjara, Kintrishi Nature Reserve, sidebrook of Cherulisghele Stream, N41°44.003' E42°04.922', 1040m, 26.





**Figures 207–210.** *Rhyacophila kimara* Oláh & Vinçon sp. nov. Holotype: 207 = male genitalia in left lateral view, 208 = segment IX and X in dorsal view, 209 = segment X with epiproct and paraproct in caudal view, 210 = phallic organ in lateral view.

IX.2019, leg. T. Kovács, D. Murányi & G. Vinçon (6 males, OPC).

**Diagnosis.** Segment X of this new species having a quadrangular plate without apical excision is similar to *R. torulensis* Sipahiler, but the phallic organ, particularly the paired dorsal process of the phallosome and the aedeagus is similar to *R. camiliensis* Sipahiler.

**Description.** Male (in alcohol). Small-sized, medium brown animal with lighter appendages and light brown wing membrane. Maxillary palp formula is II-I-III-V-IV. Forewing length 7 mm.

**Male genitalia.** In lateral view IXth segment quadrangular, very short and tall, the dorsomedian process, less sclerotized apomorphic structure of this species complex, present; antecostal suture, the external groove of the antecosta has shorter dorsolateral and longer ventrolateral sutures. Segment X composed of horizontal basal and oblique distal parts; basal part is enforced by two strongly sclerotized lateral band of rods; distal part directed obliquely upward with narrowing tip; in ventrum a rounded sclerotized structure, the epiproct discernible followed by less visible

membranous U-shaped structure and tergal strap; segment X ending in a quadrangular plate in dorsal view without excision; in caudal view ovoid with lateral downward slightly broadening margin encircling the central cross-shaped small structure accompanied ventrad by the small epiproct. Vestigial cerci as dorsal setose subapical humps present on the basodorsum of the oblique distal structure of the Xth segment. Harpagones small triangular with very short dorsum and longer ventrum; coxopodites large quadrangular. Phallic apparatus consisting of the short phallosome, the fused single evertile membranous paramere and the short and membranous aedeagus (phallicata); phallosome reduced to a short phallobase; the sclerotized U-shaped phallobase very short ventrad, little longer dorsad where the two upper ends of U-shape are fused to the basodorsal part of the coxopodites; the basodorsal articulation where the tenon of phallosome (clasper hanger at Ross) and tendon of gonopod (clasper tendon of Ross) meet poorly discernible; however it is continued both sides into strongly sclerotized rounded and heavily pegged structure, the paired dorsal process of phallosome; the less sclerotized, mostly membranous aedeagus short tipped with a

more sclerotized cap; the membranous and ever-tible paramere bears large cluster of long spines subdivided into four bunches.

*Etymology.* *kimara* from *chimaros* male goat and *chimaira* female goat in Greek and coined in Hungarian, a Greek mythical creature with body parts taken from various animals. A symbol to describe anything composed of very disparate parts. Here it refers to taxonomical incongruence with structural units coming from different species from *R. torulensis* and *R. camiliensis*.

### **Integripalpia**

### **Plenitentoria**

### **Phryganeoidea superfamily**

### **Phryganeidae**

#### ***Phryganea rotundata* Ulmer, 1905**

*Material examined.* **Georgia**, Samtskhe-Javakheti region, Paravani River below Saghamo Lake, N41°17.588' E43°43.726', 2015m, 14.VII.2019 leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (4 males, 2 females, OPC).

### **Limnephiloidea superfamily**

### **Lepidostomatidae**

#### ***Lepidostoma batumicum* Martyov, 1913**

*Material examined.* **Georgia**, Gouria region, brooklet, tributary of Bzhuzhi River, above Gomi, 41°52'25" N, 42°06'19"E, 390m, 24.IX.2019, leg. G. Vinçon (1 male, OPC).

#### ***Lepidostoma chaldyrense* Martyov, 1909**

*Material examined.* **Azerbaijan**, Nakhchivan AR, Ordubad District, Tivi village, river Tivi, sweep netting, N 39° 8'0.24" E 45°55'47.07", 25.VI.2019, leg. I. Kerimova (5 males, OPC). Azerbaijan, Göygöl district, Göygöl N.P., forest brook along the road, N40°26.223' E46°20.289', 1230m, leg. T. Kovács, P. Manko, D. Murányi, 30.IX.2019 (4 male, OPC). Azerbaijan, Gədəbəy

district, Gədəbəy, big stream S of the village, N40°27.218' E45°43.045', 1510m, 1.X.2019, leg. T. Kovács, P. Manko, & D. Murányi (3 males, OPC). **Georgia**, Kakheti region, Napareuli, Lopota Lake and its inlet brook, N42°03.407' E45°31.636', 475m, 1.V.2019, leg. D. Murányi et al. (1 male, OPC).

#### ***Lepidostoma longiplicatum* Martyov, 1913**

*Material examined.* **Georgia**, Mingrelie and High Svanetie region, Ingouri dam tributary, steep mossy brook, 42°51'31" N, 42°02'01"E, 550m, 22.IX.2019, leg. G. Vinçon (1 male, OPC). Georgia, Mtskheta-Mtianeti region, sidestream of Terek r. with small waterfall in narrow rocky ravine, below Tsdo village, 42°40'56.379"N, 44°37'58.846"E, 1710m, 6.VII.2019, leg. P. Manko (1 male, OPC). Georgia, Mtskheta-Mtianeti region, Kharkheti (Nadibani), Aragvi River and its sidestream and sidesprings, N42°24.961' E44°36.254', 1235m, 9.VII.2019, leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (1 male, OPC). Georgia, Mtskheta-Mtianeti region, Juta, open springbrooks above (E of) the village 2340m, N42°34.474' E44°45.249', 11.VII.2019, leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (5 males, OPC). Georgia, Mtskheta-Mtianeti region, Mejilauri, forest and bushy springs and outlets, N42°19.423' E44°38.732', 1270m, 13.VII.2019, leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (2 males, OPC).

#### ***Lepidostoma mesoplicatum* Martyov, 1913**

*Material examined.* **Georgia**, Mtskheta-Mtianeti region, Dariali, lateral small spring in the Khde River valley above the dam, 42°43'54"N, 44°38'40"E, 1610m, 2.X.2019, leg. G. Vinçon (2 males, OPC). Georgia, Mtskheta-Mtianeti region, Gveleti, Tibistskali Stream above its mouth to Terek River, N42°42.605' E44°37.597', 1440m, 12.VII.2019, leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (1 male, OPC). Georgia, Mtskheta-Mtianeti region, sidestream of Terek r. with small waterfall in narrow rocky ravine, below Tsdo village, 42°40'56.379"N, 44°37'58.846"E, 1710m, 6.VII.2019, leg. P. Manko (6

males, OPC). Georgia, Mtskheta-Mtianeti region, Juta, open springbrooks above (E of) the village 2340m, N42°34.474' E44°45.249', 11.VII.2019, leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (7 males, OPC). Georgia, Mtskheta-Mtianeti region, Mejilauri, forest and bushy springs and outlets, N42°19.423' E44°38.732', 1270m, 13.VII.2019, leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (3 males, OPC).

***Martynomyia tripartita* (Martynov, 1913)**

*Material examined.* **Georgia**, Mtskheta-Mtianeti region, Mejilauri, forest and bushy springs and outlets, N42°19.423' E44°38.732', 1270m, 13.VII.2019, leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (1 male, 2 females, OPC). Georgia, Mingrelia and High Svanetia region, spring, Nakra valley, Utviri tributary, 43°04'41" N, 42°22'05"E, 1520m, 23.IX.2019, leg. G. Vinçon + Georgia, Mingrelia and High Svanetia region, spring, Nakra valley, Utviri tributary, 43°04'41" N, 42°22'13"E, 1510m, 23.IX.2019, leg. G. Vinçon (1 male, OPC). Georgia, Mingrelia and High Svanetia region, Khaishura River tributary, same torrent above Kveda Vedi until its spring, 42°54'47" N, 42°11'05"E, 1300-1500m, 22.IX.2019, leg. G. Vinçon (1 male, OPC).

**Brachycentridae**

***Brachycentrus americanus* Banks 1899**

*Material examined.* **Kazakhstan**, Kokcy Valley stream, N44°41'03" E78°57'31", 1300m, 2-3.VI.2019, leg. Z. Varga (5 males, 1 female, OPC).

***Micrasema bifoliatum* Martynov, 1925**

*Material examined.* **Azerbaijan**, Nakhchivan AR, Ordubad District, Tivi village, river Tivi, sweep netting, N39°8'0.24" E45°55'47.07", 25.VI. 2019, leg. I. Kerimova (6 males, OPC).

**Goeridae**

***Silo tuberculatus* Martynov, 1909**

*Material examined.* **Georgia**, Kvemo Kartli region, Sakdrioni, Khrami River above Tsalka

Reservoir, N41°35.559' E43°56.917', 1520m, 15.VII.2019, leg. T. Kovács, D. Murányi & D. Vinçon (1 male, OPC)

**Apataniidae**

***Apatania subtilis* Martynov, 1909**

*Material examined.* **Georgia**, Imereti region, Racha range, Khotevi, Gortskali Stream and spring with alder-poplar gallery, N42°27.772' E43°08.282', 855m, 18.IX.2018 leg. D. Murányi et al (3 males, OPC). Georgia, Racha-Lechkhumi & Kvemo Svaneti region, Svaneti range, Benieri, spring outlet and open brook, N42°48.638' E43°06.654', 1335m, 16.IX.2018, leg. D. Murányi et al. (4 males, 1 female, OPC). Georgia, Mtskheta-Mtianeti region, Kvemo Mleta, spring and its outlet, N42°25.907' E44°30.460', 1485m, 27.IV.2019, leg. D. Murányi et al. (4 males, OPC). Georgia, Mtskheta-Mtianeti region, Juta, spring brooks in the Chaukhistskali River valley, N42°33.227' E44°46.367', 2600m, 11.VII.2019, leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (1 male, *major*, OPC). Georgia, Mtskheta-Mtianeti region, upper section of Chaukhistskali Stream, and its sideseep, N42°33.320' E44°46.625', 2645m, 11.VII.2019, leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (1 male, *major*, OPC). Georgia, Mtskheta-Mtianeti region, Gudauri, open brook along the military road, N42°29.521' E44°28.037', 2250m, 9, 13.VII. 2019, leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (1 male, *major*, OPC). Georgia, Mtskheta-Mtianeti region, Sno, karst stream below (N of) the village, N42°36.937' E44°37.640', 1765m, 12.VII.2019, leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (3 males, *major*, OPC). Georgia, Mtskheta-Mtianeti region, springs and their outlet brooks N of Jvari Pass, N42°31.123' E44°27.872', 2380m, 9.VII. 2019, leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (11 males, 3 females, *major*, OPC). Georgia, Mtskheta-Mtianeti region, Zemo Mleta, brook and seeps along the military road N42°26.177' E44°29.683', 1565m, 9.VII.2019, leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (1 male, *minor*, OPC). Georgia, Mtskheta-Mtianeti region, Kharkheti (Nadibani), Aragvi River and its sidestream and

sidesprings, N42°24.961' E44°36.254', 1235m, 9.VII.2019, leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (3 males, *minor*, OPC).

### *Apataniana* Mosely, 1936

This genus was erected by the character states in hindwing venation that is by the retained plesiomorphic closed discoidal cell and by the integratively organised secondary sexual character of the upward produced flap along the costal vein towards the base. This fold is housing and wrapping a cluster of variously long androconial hairs. The genital structure of the *Apataniana* genus is well in the range of the shape divergences of the *Apatania* genitalia. Moreover, the androconial structure is a secondary sexual trait having only species ranking value. The closed discoidal cell on the hindwing seems the single generic character. The closed plesiomorphic state of the discoidal cell is present however in other apataniid genera and as usual only the character combination may help us to fabricate some artificial construct of taxa. Similarly, we rely on character combination in our trial to delineate lineages in the *Apataniana* genus.

*Infrageneric lineage sorting.* The discovery, examination, description and the need to diagnose the three new Caucasian *Apataniana* species forced us to survey briefly the taxonomic lineages in this small genus. Lineage sorting in the *Apataniana* genus similarly to sorting any kind of entities is an artificial trial because of stochastic nature of ontology and the probabilistic limits in epistemology. This reality of taxonomy is due to the chimeric nature of reticulation adjusted by integrative organisation against the permanent disintegrative divergences under the stochastic impacts of external and internal effects (Oláh et al. 2019). A simplified conclusion is resulted in stating that any kind of classification is existentially artificial, and any kind of taxa or lineages is chimerical or at least chimeric.

We have delineated four lineages in this small genus. However, each lineage is an artificial construct due to taxonomic incongruences coping

with the stochastic ontology of reality. Here we call these lineages as species groups.

(1) *Apataniana bulbosa* species group: the fused mesal arm of the dorsal branch of the paraproct elongated, without downward hooked apices; parameres are variously setosed with small stimulatory spine-like structures; harpago straight.

(2) *Apataniana elongata* species group: the fused mesal arm of the dorsal branch of the paraproct abbreviated, without downward hooked apices; parameres without stimulatory spine-like structures; paramere stouter; harpago straight.

(3) *Apataniana hellenica* species group: the fused mesal arm of the dorsal branch of the paraproct abbreviated; with downward hooked lateral profile; parameres setaless; paramere slender; spine-tipped head of harpago turning mesad.

(4) *Apataniana cornuta* species group: the fused mesal arm of the dorsal branch of the paraproct elongated; without downward hooked lateral profile; paramere setaless; longer than aedeagus; harpago deeply subdivided into a pair of thin filiform processes.

*Lineage sorting of siblings.* Adaptive traits are more resistant than neutral ones against the external and internal stochastic impacts (Oláh & Oláh 2017). Therefore, it is more promising to search adaptive traits in order to classify taxa more reliably. Adaptivity is easily detected by shape diversity. Diversity of any genital substructure is indicative of adaptive sexual processes in an integrative organisation. Once we have recognised the speciation trait of adaptive origin it is indispensable to give higher character weighting value to these adaptive structures in evaluating the character combinations.

Concluding from the magnitude of shape diversities in the *Apataniana borcka* species complex we have given the high diagnostic value to the paraproct followed by harpago of the gonopods. The parameres exhibit low diversity in this species complex. Only the nominate species *A. borcka* has S-shaped divergence of paramere; the other three species have practically identical and very simple, small spine-like parameres. It

seems that the the second segment of the gonopod, the mesad turning harpago with very pointed apices of high diversity took over the stimulatory functions in integrative sexual processes.

#### *Apataniana cornuta* Ivanov, 1991

*Material examined.* **Kazakhstan**, Kokcy Valley stream, N44°41'03" E78°57'31", 1300m, 2–3.VI.2019, leg. Z. Varga (1 male, 3 females, OPC).

#### *Apataniana hellenica* species group

This species group has the fused mesal arm of the dorsal branch of the paraproct short and the downward hooked apex is especially well produced; parameres setaless; paramere slender; spine-tipped head of harpago mesad turning. Seven known species belong to this species group: *A. bakurianica* sp. nov.; *A. borcka* Sipahiler, 1996; *A. goderdza* sp. nov.; *A. hellenica* Malicky, 1987; *A. kintrisha* sp. nov.; *A. stropones* Malicky, 1993; *A. vardusia* Malicky, 1992.

#### *Apatania borcka* species complex

This small species complex in the *A. hellenica* species group is distinguished by (1) the distribution character state inhabiting various mountain ranges of the Lesser Caucasus; (2) the fused mesal arm of the dorsal branch of the paraproct has distal downward and anterad curving ending, the head of pronounced hook-formation in its lateral profile; (3) the harpago of the gonopod directed strongly mesad with long and pointed apices. Four species belongs to this complex: *A. bakurianica* sp. nov.; *A. borcka* Sipahiler, 1996; *A. goderdza* sp. nov.; *A. kintrisha* sp. nov.

*Apataniana bacurianica* Oláh & Vinçon, sp. nov.  
(Figures 211–214, 215–217, Map 12, Photos 39–41)

*Material examined.* Holotype: **Georgia**, Samtskhe-Javakheti region, spring and brooklet in grassy land, tributary of Borjomula River, above

Bakuriani, 41°41'35"N, 43°31'02"E, 2270–2350 m, 29.IX.2019, leg. G. Vinçon (1 male, OPC). Allotype: same as holotype (1 female, OPC). Paratypes: same as holotype (8 males, 2 females OPC; 2 males, 1 female, NMPC).

*Diagnosis.* Based on the character combination, briefly presented below, *Apatania bacurianica* sp. nov. belongs to the *Apataniana borcka* species complex of the *Apatania hellenica* species group and most close, very similar and represents a sibling status to *A. borcka* Sipahiler described from the nearby cross border Borcka in Turkey. However, the new species *A. bacurianica* has the lateral arms of the dorsal branch of the paraproct with upward directed apex; the mesal fused arms of the dorsal branch of the paraproct is similarly downward hooked, but clearly has an arrow-shape in dorsal profile; the mesad turning harpago broad-based and more robust; the paramere with regular arching, not S-shaped in ventral view.

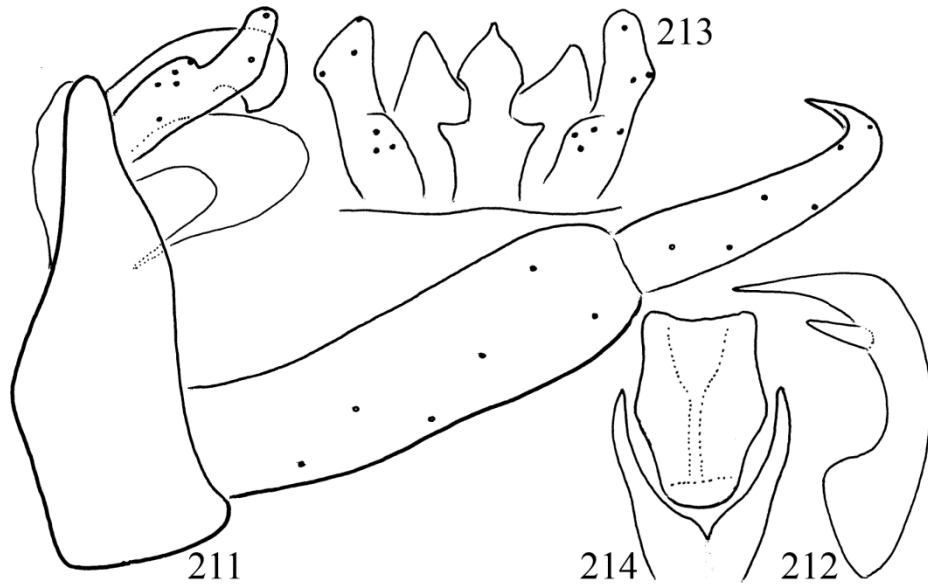
*Description.* Medium sized darkly pigmented species with forewing length of 9 mm and with almost black thoracic sclerites. The generic character, the closed discoidal cell is present on hindwing as well as the narrow upward curving flap is discernible along about the basal half of the costal vein wrapping very long black androconial setae.

*Etymology.* Named after the region of the type locality.

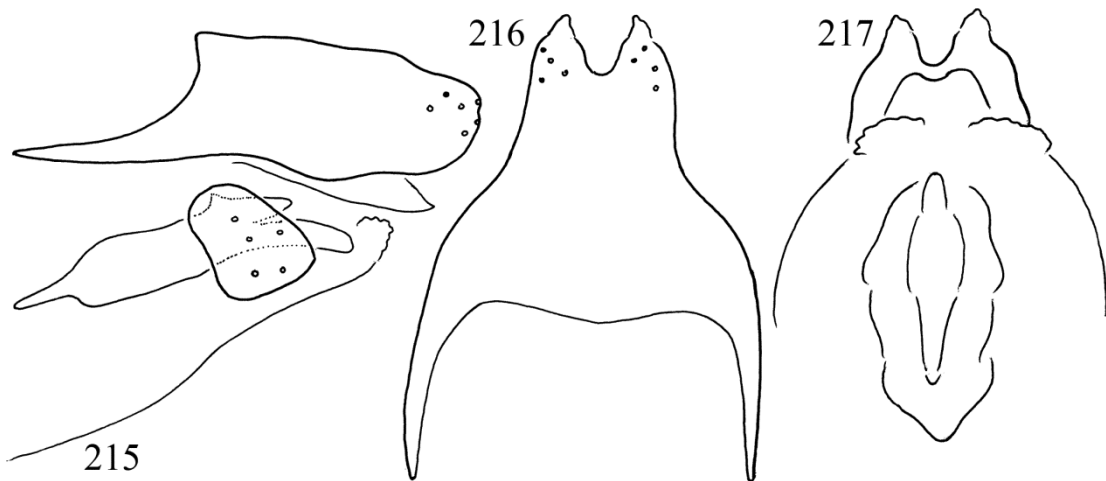
#### *Apataniana borcka* Sipahiler, 1996

(Map 12)

*Apataniana borcka* Sipahiler, 1996:118–123. "Holotype male, allotype female and paratypes (24 males, 4 females): Turkey, Artvin, Borcka, Camili, Gorgit yaylasi, near Mavigöl, 2200 m, 15 km SE of Camili, (41°55'E 41°40'N), 28.IX.1994, leg. and coll. Sipahiler." "Affinities: *Apataniana borcka* sp. nov. belongs to the *bulbosa*-group and is more closely related to *A. bulbosa* found in east Siberia and the Greek species *A. vardusia* Malicky than the other species, *A. hellenica* Malicky and *A. stropones* Malicky found in Greece."



**Figures 211–214.** *Apataniana bacurianica* Oláh & Vinçon, sp. nov. Holotype: 211 = male genitalia in left lateral view, 212 = harpago in ventral view, 213 = genitalia in dorsal view, 214 = aedeagus and parameres in dorsal view.



**Figures 215–217.** *Apataniana bacurianica* Oláh & Vinçon, sp. nov. Allotype: 215 = female genitalia in left lateral view, 216 = female genitalia in dorsal view, 217 = female genitalia in ventral view.

***Apataniana goderdza* Oláh & Kovács sp. nov.**

(Figures 218–221, Map 12, Photo 32)

*Material examined.* Holotype: **Georgia**, Adjara, downflow of the Mtsvane Tba (Green Lake), N of Goderdzi Pass, N41°40'41.49" E42°29'54.69", 2055m, 27.IX.2019, leg. T. Kovács (1 male, OPC). Paratypes: same as

holotype (2 males, OPC; 1 male, NMPC). Georgia, Adjara, Kintrishi Nature Reserve, above Khino, spring of Kintrishi River and brook, 41°45'31"N 42°06'50"E, 2300m, 26.IX.2019, leg. G. Vinçon (1 male, OPC). Georgia, Adjara, Beshumi, seeps, brooks and stream in open forest, N41°37.356' E42°32.329', 1940m, 27.IX.2019, leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (1 male, OPC).

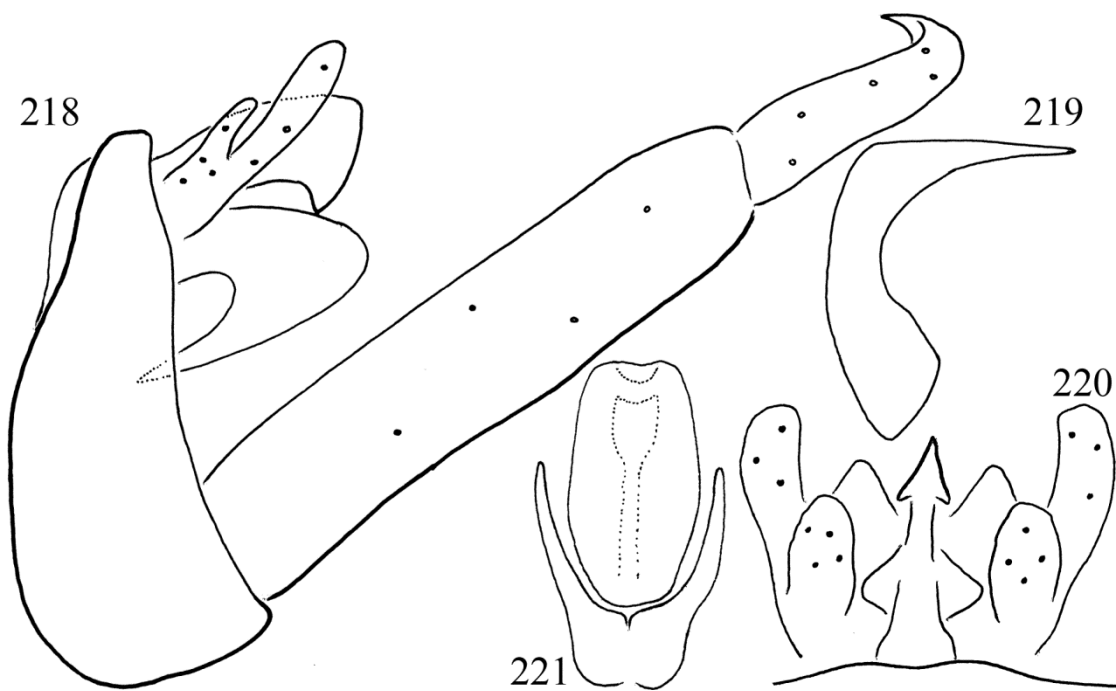
*Diagnosis.* Based on the character combination, briefly presented below, *Apatania goderdza* sp. nov. belongs to the *Apataniana borcka* species complex of the *Apatania hellenica* species group and most close, very similar and represents a sibling status to *A. kintrisha* sp. nov. However, the new species *A. goderdza* has cerci almost free, not fused to the lateral arms of the dorsal branch of the paraproct; the mesal fused arms of the dorsal branch of the paraproct is similarly downward hooked, but clearly has a triangular, not rounded head; the mesad turning harpago has deep and circular curvature but its dorsum is straight, not rounded.

*Description.* Medium sized darkly pigmented species with forewing length of 9 mm and with almost black thoracic sclerites. The generic character, the closed discoidal cell is present on

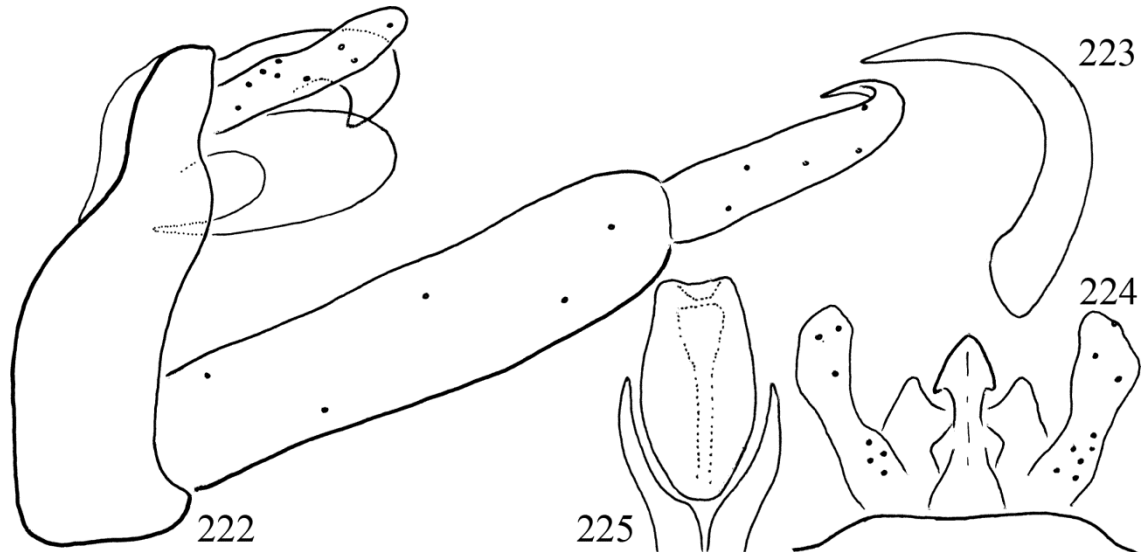
hindwing as well as the narrow upward curving flap is discernible along about the basal half of the costal vein wrapping very long black androconial setae.

*Female genitalia.* Segment IX is represented by the more produced tergum fused with segment X and produced unique pair of anterad directed long apophyses and by a sclerotically detached rounded sternum. Tergum IX has setose distal ending deeply excised, bilobed in dorsal view. Sternum X, the supragenital plate, the upper vaginal lip weakly sclerotized bilobed in ventral view, pointed in lateral view. The lower vaginal lip, the trifid vulvar scale is lacking overrun by the produced sternum of segment VIII. Vaginal sclerite complex elongated.

*Etymology.* Named after the region of the type locality.



**Figures 218–221.** *Apataniana goderdza* Oláh & Kovács, sp. nov. Holotype: 218 = male genitalia in left lateral view, 219 = harpago in ventral view, 220 = genitalia in dorsal view, 221 = aedeagus and parameres in dorsal view.



Figures 222–225. *Apataniana kintrisha* Oláh & Vinçon, sp. nov. Holotype: 222 = male genitalia in left lateral view, 223 = harpago in ventral view, 224 = genitalia in dorsal view, 225 = aedeagus and parameres in dorsal view.

***Apataniana kintrisha* Oláh & Vinçon, sp. nov.**

(Figures 222–225, Map 12, Photos 23–24)

*Material examined.* Holotype: **Georgia**, Adjara, Kintrishi Nature Reserve, above Khino, spring of Kintrishi River and brook, 41°45'31"N 42°06'50"E, 2300m, 26.IX.2019, leg. G. Vinçon (2 males, OPC).

*Diagnosis.* Based on the character combination, briefly presented below, *Apatania kintrisha* sp. nov. belongs to the *Apataniana borecka* species complex of the *Apatania hellenica* species group and most close, very similar and represents a sibling status to *A. goderdza* sp. nov. However, the new species *A. kintrisha* has cerci fused to the lateral arms of the dorsal branch of the paraproct, not free; the mesal fused arms of the dorsal branch of the paraproct is similarly downward hooked, but clearly has a rounded, not triangular head; the mesad turning harpago has deeper curvature with rounded, not straight dorsum.

*Description.* Medium sized darkly pigmented species with forewing length of 9 mm and with almost black thoracic sclerites. The generic charac

ter, the closed discoidal cell is present on hindwing as well as the narrow upward curving flap is discernible along about the basal half of the costal vein wrapping very long black androconial setae.

*Etymology.* Named after the region of the type locality.

**Limnephilidae**

**Drusinae**

***Drusus amanaus* species complex**

This species complex has dorsal branch of the paraproct with straight apical arms of subtle diverging shapes in latero-perpendicular view, widely bifid in caudal view. Yellowish, middle size species known as distributed in allopatry in the Western Caucasus (Oláh et al. 2017). Three sibling species were known belonging to this complex: *D. amanaus* (Russia: Upper Teberda River valley); *D. kumanskii* (Russia: probably Baksan River valley); *D. zhiltzovae* (Georgia: Abhazia Mts. Svanetia Mts.). Three new species are described here: *D. erdes* sp. nov., *D. sukul* sp. nov. and *D. teslenkoae* sp. nov.

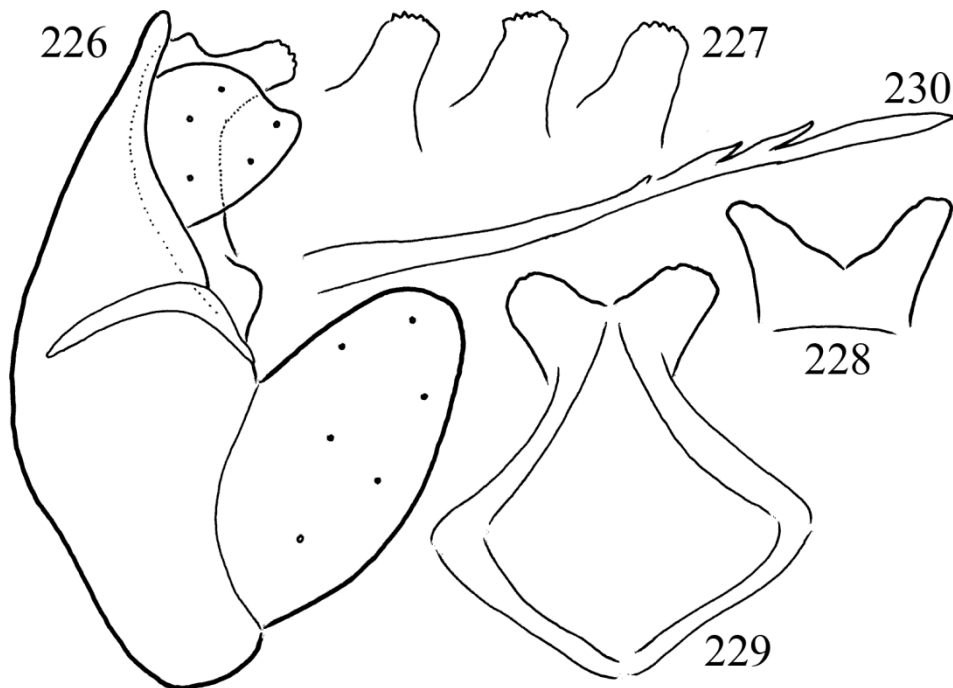


***Drusus erdes* Oláh & Vinçon, sp. nov.**

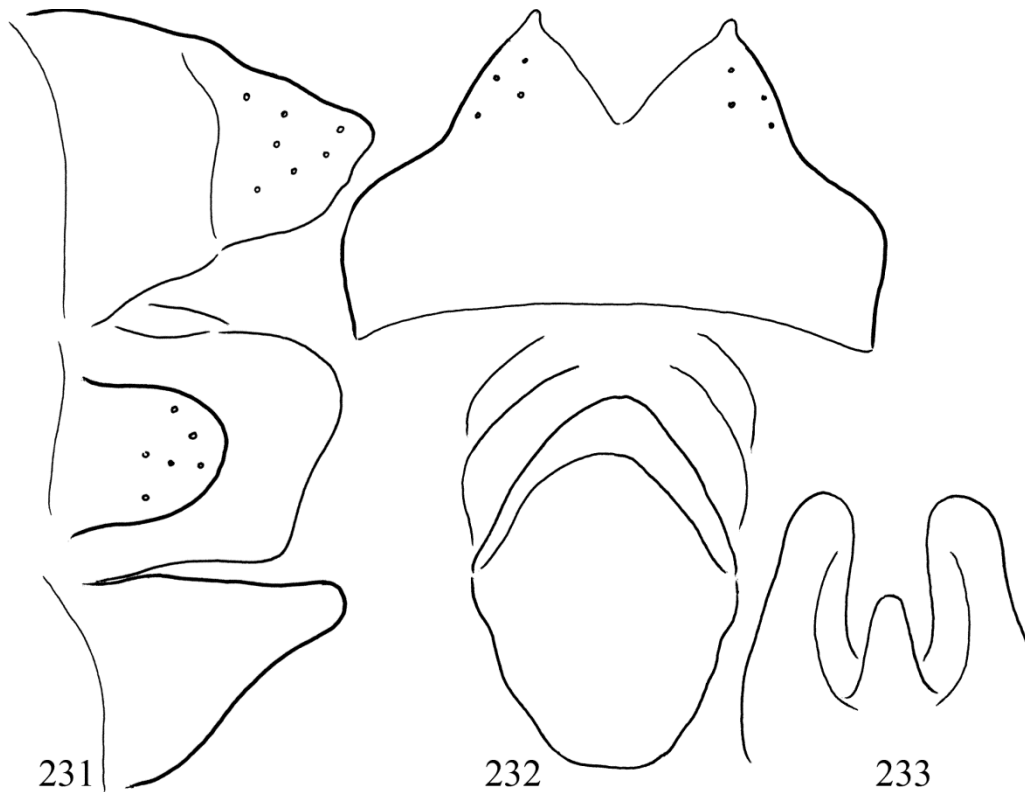
(Figures 226–233, Map 13, Photo 8)

*Material examined.* Holotype: **Georgia**, Mtskheta-Mtianeti region, Gudauri, open brook along the military road, Aragvi tributary, N42° 29.521' E44°28.037', 2250m, 13.VII.2019, leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (1 male, OPC), Allotype: same as holotype (1 female, OPC). Paratypes: same as holotype (32 males, 8 females, OPC; 5 males, 1 female, NM PC). Georgia, Mtskheta-Mtianeti region, springs and their outlet brooks N of Jvari Pass, Terek tributary, N42°31.123' E44°27.872', 2380m, 9.VII.2019, leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (1 female, OPC). Georgia, Mtskheta-Mtianeti region, brook beneath (W of) Gergeti Trinity Church, Terek tributary, N42° 39.799' E44°36.162', 2290m, 10.VII.2019, leg. G. Vinçon (5 males, 3 females, OPC). Georgia,

Kazbegi, Mtscheta-Mtianeti, tributary of the Terek r., brook beneath (W of) Gergeti Trinity Church, 42°39'45.566"N, 44°36'38.605"E, 2145 m, 4.VII.2019, leg. P. Manko (2 male, 2 females, OPC). Georgia, Mtskheta-Mtianeti region, below Ukhati village, Narvani r. and its tributary confluence, 42°33'18.666"N, 44°31'19.375"E, 2060 m, 7.VII.2019, leg. P. Manko (1 male, 1 female, OPC). Georgia, Mtskheta-Mtianeti region, forest spring and small sidebrook of Chkheri River crossing forest road, 42°40'12.025"N, 44°36'36.781"E, 2050m, 4.VII.2019, leg. P. Manko (1 male, 3 females, OPC). Georgia, Imereti region, Brook and spring, North slope of Zekari pass, Kershaveti tributary, N41°50'07" E42°50'12", 2050m, 17.VII.2019, leg. Vinçon (5 males, 1 female, OPC). Georgia, Imereti region, steep brook and spring, north slope of Zekari pass, below Didmaghala Pic, Tsablarastskali tributary, 41°50'55"N, 42°47'43"E, 2080m, 28.IX.2019, leg. G. Vinçon (1 male, 1 female, OPC).



**Figures 226–230.** *Drusus erdes* Oláh & Vinçon, sp. nov. Holotype: 226 = male genitalia in left lateral view, 227 = head of the arms of paraproct dorsal branch of holotype and paratypes in latero-perpendicular view, 228 = the arms of the paraproct dorsal branch in dorsal view, 229 = paraproct in caudal view, 230 = paramere in lateral view.



**Figures 231–233.** *Drusus erdes* Oláh & Vinçon, sp. nov. Allotype: 231 = female genitalia in left lateral view, 232 = the fused tergum IX and segment X with the vaginal sclerite complex in dorsal view, 233 = vulvar scale (lower vaginal lip) in ventral view.

*Diagnosis.* The most easily visible and stable shape divergence, distinguishing this species from its sibling *D. amanaus* is the head shape of the arms of the dorsal branch in latero-perpendicular view. The perpendicular shape of the arm head is subquadrangular and its apical margin is characterized by well-produced dental pattern; this dental development on the tip of the dorsal arm produces outgrowths slightly and variously produced on the posterior corner. Beside this perpendicular view there are also stable divergences distinguishing this new species from its siblings in the paraproct head shape also in the dorsal, lateral and caudal view, but again highly observer-dependent to reproduce the exact viewing and drawing angles.

*Description.* Light brown animal with forewing length of 10 mm. In the paramere spine pattern the 2 secondary spines located anterad to the recumbent primary spine are less developed;

apical shaft of the paramere less robust and less dilated and 2 times longer than the length of the primary spine.

*Female genitalia.* Tergite of segment IX forming short tube, open ventrally, with V-shaped mesal excision; lateral lobes pointed triangular in dorsal view; the lateral setose lobe of sternite IX elongated with rounded apical margin. Segment X membranous and embedded inside segment IX and encircling anus; supragenital plate of segment X well-developed and quadrangular in lateral view. Median lobe of the vulvar scale (lower vaginal lip) present half long as the lateral lobes. Dorsal profile of the vaginal sclerite complex narrowing anterad.

*Etymology.* *erdes*, coined from “érdes” rough, scabrous in Hungarian, refers to the apical surface of the dorsal arm of the dorsal branch of the paraproct having well-produced short and strong dental processes covering the apicomeral region

of the paramere head. The presence of dental pattern on the apical margin of the dorsal arm characterizes the incipient siblings of the *Drusus amanaus* species complex, but less developed or less discernible.

***Drusus sukul* Oláh & Vinçon, sp. nov.**

(Figures 234–239, Map 13, Photos 9–11)

*Material examined.* Holotype: **Georgia**, Mtskheta-Mtianeti region, sidespring of Chkheri River above Altihut 3014 mountain shelter, N42°39'38" E44°33'37", 3060m, 10.VII.2019, leg. G. Vinçon (1 male, OPC). Allotype: same as holotype (1 female, OPC). Paratypes. same as holotype (3 males, 1 female, OPC). Georgia, Mtskheta-Mtianeti region, sidespring of Chkheri River beneath Altihut 3014 mountain shelter, N42°39.596' E44°33.797', 2940m, 10.VII.2019, leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (1 male, 1 female, OPC). Georgia, Mtskheta-Mtianeti region, brook beneath (W of) Gergeti Trinity Church, N42°39.799' E44°36.162', 2290m, 10.VII.2019, leg. G. Vinçon (3 males, OPC). Mtskheta-Mtianeti region, upper section of Chaukhistskali Stream, and its sideseep, N42°33.320' E44°46.625', 2645m, 11.VII.2019, leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (1 male, OPC). Georgia, Mtskheta-Mtianeti region, Juta, spring brooks in the Chaukhistskali River valley, Terek tributary, N42°33.227' E44°46.367', 2600m, 11.VII.2019, leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (2 male, 9 females, OPC). Georgia, Mtskheta-Mtianeti region, Juta, Chaukhistskali River above (E of) the settlement, N42°33.868' E44°45.689' 2385m, 11.VII.2019, leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (7 males, 3 females, OPC). Georgia, Mtskheta-Mtianeti region, Juta, open spring brooks above (E of) the village, N42°34.474' E44°45.249', 2340m, 11.VII.2019, leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (1 male, OPC).

*Diagnosis.* The most easily visible and stable shape divergence, distinguishing this species from its sibling *D. erdes* is the head shape of the arms of the dorsal branch in latero-perpendicular view. The perpendicular shape of the arm clearly nar-

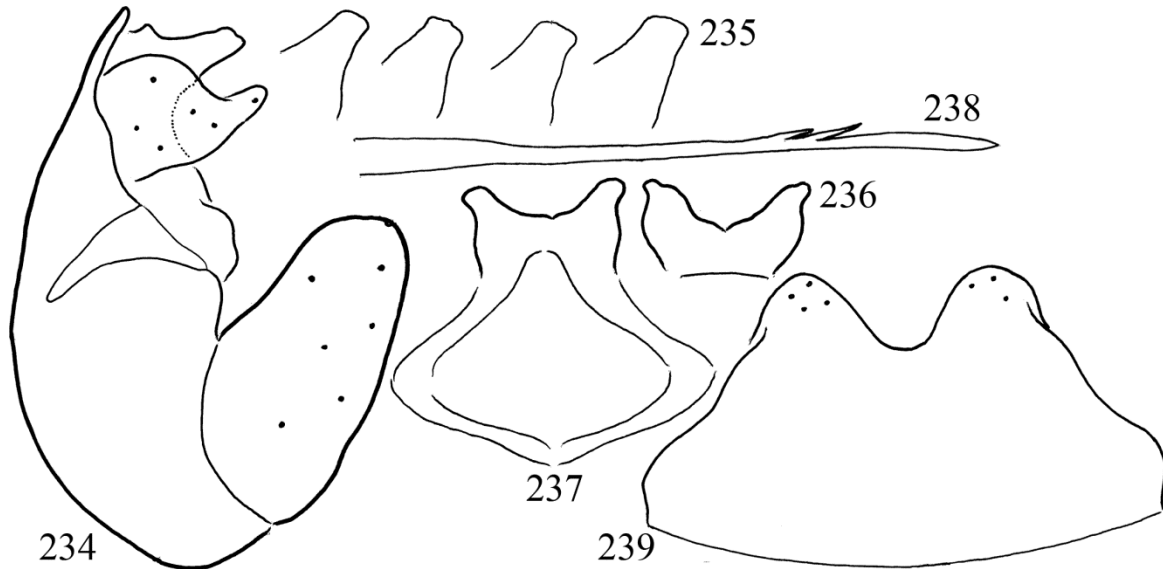
rowing; the dental development on the tip of the dorsal arm produces outgrowths only slightly produced on the posterior corner. Beside this perpendicular view there are also stable divergences distinguishing this new species from its siblings in the paraproct head shape also in the dorsal, lateral and caudal view, but again highly observer dependent to reproduce the exact viewing and drawing angles. The gonopods, although variable but seem less robust and slender. The dorsal profile of the female anal tube is clearly diverged; the tips of its lateral lobes rounded, not pointed.

*Description.* Light brown animal with forewing length of 10 mm. In the paramere spine pattern the single secondary spines attached anterad to the recumbent primary spine are less developed; apical shaft of the paramere dilated and 3 times longer than the length of the primary spine.

*Female genitalia.* Tergite of segment IX forming short tube, open ventrally, with V-shaped mesal excision; lateral lobes with rounded tip in dorsal view; the lateral setose lobe of sternite IX elongated with rounded apical margin. Segment X membranous and embedded inside segment IX and encircling anus; supragenital plate of segment X well-developed and quadrangular in lateral view. Median lobe of the vulvar scale (lower vaginal lip) present half long as the lateral lobes. Dorsal profile of the vaginal sclerite complex narrowing anterad.

*Etymology.* *sukul*, coined from “szűkül” narrow, go to narrow in Hungarian, refers to the dorsal arm of the dorsal branch of the paraproct having narrowing apex.

*Contact populations.* We have found some intermediate shape divergences at the lower elevation. There could be genuine contact mixed populations between *D. erdes* sp. nov. and *D. sukul* sp. nov. not sampled during this trip. This is a frequent phenomenon if we try to delineate very closely related, contemporary split, or just under splitting, sibling species. To generate more exact knowledge, it would require a very complex study with proper and very intensive population sampling.



**Figures 234–239.** *Drusus sukul* Oláh & Vinçon, sp. nov. Holotype: 234 = male genitalia in left lateral view, 235 = head of the arms of paraproct dorsal branch of holotype and paratypes in latero-perpendicular view, 236 = the arms of the paraproct dorsal branch in dorsal view, 237 = paraproct in caudal view, 238 = paramere in lateral view, 239 = the fused tergum IX and segment X of female allotype.

***Drusus teslenkoae* Oláh & Vinçon, sp. nov.**

(Figures 240–244, Map 13, Photo 27)

**Material examined.** Holotype: **Georgia**, Adjara region, Mtirala National Parc, above Chakvis-tavi, tributary of Sachokhia River, 41°39'28" N, 41°52'30"E, 1000m, 25.IX.2019, leg. G. Vinçon (1 male, OPC). Allotype. same as holotype (1 female, OPC). Paratypes: same as holotype (1 male, 5 females, OPC).

**Diagnosis.** The most easily visible and stable shape divergence, distinguishing this species from each species of the *Drusus amanaus* species complex is the head shape of the arms of the dorsal branch. in latero-perpendicular view. It is very slender and its head turning upward and laterad.

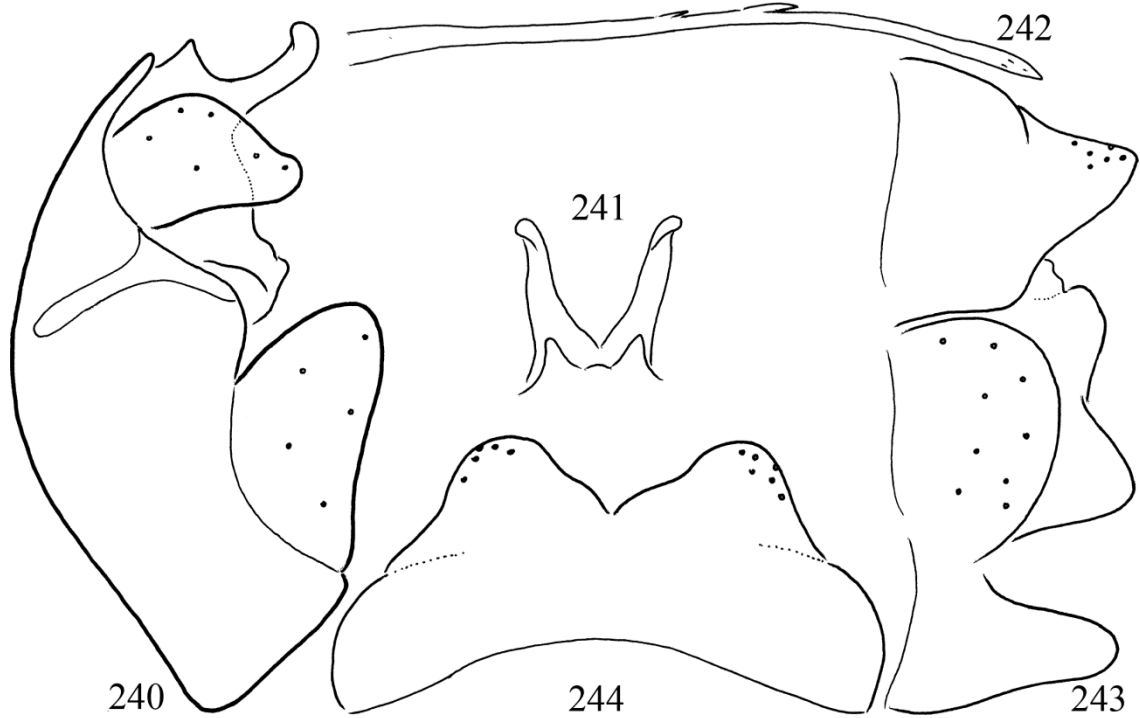
**Description.** Light brown animal with forewing length of 10 mm. In the paramere spine pattern a single secondary spine located anterad to the recumbent primary spine is less developed; apical shaft of the paramere less robust and less dilated and 7 times longer than the length of the primary spine.

**Female genitalia.** Tergite of segment IX forming short tube, open ventrally, with V-shaped mesal excision; lateral lobes rounded triangular in dorsal view; the lateral setose lobe of sternite IX forms an unusually produced large rounded setose plate. Segment X membranous and embedded inside segment IX and encircling anus; supra-genital plate of segment X well-developed and quadrangular in lateral view with mesal wide triangular excision. Median lobe of the vulvar scale (lower vaginal lip) present as a very thin digitiform process little more than half long as the lateral lobes. Dorsal profile of the vaginal sclerite complex narrowing anterad.

**Etymology.** This peculiar *Drusus* species of the *Drusus amanaus* species complex is dedicated to Valentina Teslenko (Vladivostok) who has made a great job for Russian stoneflies.

***Drusus caucasicus* species group**

Species group of the inflated paramere terminalia! *Drusus caucasicus* species group is integrated through ancestral divergence by the recumbent primary spine and secondary spines



**Figures 240–244.** *Drusus teslenkoae* Oláh & Vinçon, sp. nov. Holotype: 240 = male genitalia in left lateral view, 241 = arms of paraproct dorsal branch in dorsal view, 242 = paramere in lateral view, 243 = female allotype genitalia in lateral view, 244 = the fused tergum IX and segment X of female allotype.



**Map 12.** Distribution of *Apataniana borcka* species complex (full circles represent the type localities)



Map 13. Distribution of *Drusus* species (full circles represent the type localities)

reduced in size and by inflated apical paramere shaft. This species group is characterized by further spine pattern reduction on paramere and by specialised enlargement of the paramere terminal section by inflation. Primary spine present, not perpendicular, decumbent or recumbent reduced to some vestigial structure. Secondary spines mostly present. Tertiary spines seldom present. Paramere terminal section enlarged, inflated, expanded, and usually thicker than the paramere shaft. Surface of the terminal section frequently piliferous, tomentose pubescent, covered with fine hairs. Top of terminal section sometimes modified into an individualised pin tip structure. Paraproct, especially the ventral arm, is strongly developed and forms a closed ring around anus with much produced triangularly shaped ventrolateral corner. The delineation of the two species complexes in the species group is based on divergences in the entire paraproct architecture: *Drusus caucasicus* and *Drusus simplex* species complexes.

#### ***Drusus caucasicus* species complex**

In this species complex, the paramere is characterized by inflated terminalia and the setaless

dorsal arm of the paraproct fused to the dorso-mesal region of the setose cerci resulting in an apparent bilobed shape of the cerci. The outer plate-shaped setose lobe is the genuine cercus and the digitiform setaless inner process is the fused dorsal arm of the paraproct. Various retained suture is discernible between these fused structures of somite (paraproct) and podite (cercus) origin of the XIth abdominal segment. The discovered species of this complex populate eastern Turkey, Caucasus and Hamadan Province in western Iran. *Drusus caucasicus* species complex is comprised of seven known species: *baksan* Oláh, 2017 (Russia: Baksan River valley), *bayburthii* Cakin, 1983 (Turkey, Van Province), *botos* Oláh, 2017 (Turkey, Agri and Erzurum Provinces), *caucasicus* Ulmer, 1907 (Georgia, Russia), *fuesunae* Malicky, 1974 (Turkey, Trabson Province), *kazanciae* Cakin, 1983 (Turkey, Hakkari Province), *ketes* (Iran, Hamadan Province). Here we describe four new species: *Drusus csupasz* sp. nov. with the chimeric character of the bare paramere without any piliferous-tomentose-pubescent paramere surface; *D. chechensis* sp. nov. with tomentose paramere but with stout enforced digitiform setaless process on the cercal complex; *D. johansoni* sp. nov. with

tomentose paramere, with very stout and abbreviated digitiform setaless process and with circular cerci; and *D. alapos* sp. nov. having dorsal arm of the paraproct very broad-based.

The delineation of sibling species in the *Drusus caucasicus* species complex is based primarily on the subtle divergences of the adaptive trait of the setaless digitiform process of the cercal complex combined with the fine structure of the paramere as well as with character combinations of neutral traits of the cerci and gonopods. The subtle shape divergences of the adaptive digitiform process on the cercus seems stable, due probably to its intimate involvement in stimulatory functions of copulation. We have experienced some signs of developmental instability detectable by fluctuating asymmetry in the shape of the paraproct and more of the paramere that could be further complicated by reinforcement processes in mixed contact populations. However, there is no data to estimate the frequency and the extent of

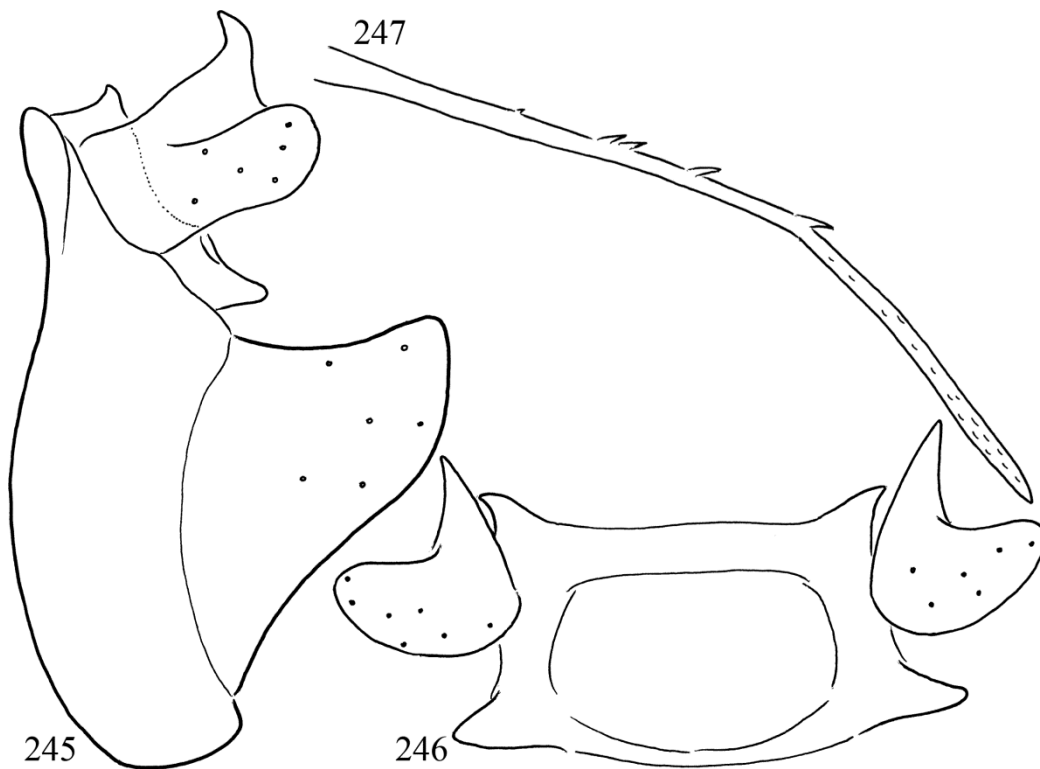
primary and secondary contacts between populations.

***Drusus alapos* Oláh sp. nov.**

(Figures 245–247, Map 13, Photos 42–43)

*Material examined.* Holotype: **Georgia**, Kve-mo Kartli region, Nardevani, open brook and seeps above (S of) the village, N41°32.991' E43°53.232', 1915m, 14.VII.2019 leg. T. Kovács, D. Murányi & T. Vinçon (1 male, OPC).

*Diagnosis.* Most close to *Drusus bayburti* Cakin, 1983 but differs by having paramere with longer tomentose terminal section. The mesal arm of the bilobed fused complex cercal structure, that is the setaless fused dorsal arm of the paraproct very broad-based well visible in lateral view, and sharp triangular in caudal view. The upper lateral corner of the quadratic paraproct heavily sclerotized, upward and lateral pointed. The neutral peripheral organ of the gonopod is upward directed, not rounded.



**Figures 245–247.** *Drusus alapos* Oláh sp. nov. Holotype: 245 = male genitalia in left lateral view, 246 = the fused paraproct cercal complex in caudal view, 247 = paramere in lateral view.

*Description.* Light brown animal with forewing length of 12 mm. Having typical architecture of the genitalia and recumbent primary and secondary paramere spines belongs to the *Drusus caucasicus* species group. The plate shaped setose cercus is fused to the digitiform setaless mesal process of paraproct origin, a character combination of the *Drusus caucasicus* species complex (Oláh et al. 2017).

*Etymology.* *alapos*, coined from “alapos” broad-based in Hungarian, refers to the lateral profile of the setaless mesal process of cerci, this extremely enlarged basement is unique in the *Drusus caucasicus* species complex.

***Drusus chechensis* Oláh, sp. nov.**

(Figures 248–250, Map 13)

*Drusus caucasicus* Ulmer, 1907. Nógrádi & Uherkovich 1992:33. Several specimens from several localities in the northern Caucasian region of the Chechen-Ingosh ASSR have been collected and determined as *Drusus caucasicus*. Misidentification!

*Material examined.* Holotype: **Russia**, Chechen Republic, (Chechen-Ingus ASSR) S from Torgim, 1300 m, 7.VIII.1988, leg. B. Herczig, K. Szeőke & Z. Mészáros (1 male, OPC). Paratypes: same as holotype (3 males, 30 females, OPC; 2 males, 10 females, NMPC). Russia, Chechen Republic, (Chechen-Ingus ASSR) Shkolnly Pereval (Pass), 2100 m, 9.IX.1989, leg. B. Herczig, G. Uherkovich, A. Horváth, Gy. Szollát & A. Sárközi (1 male, 1 female, OPC). Russia, Chechen Republic, (Chechen-Ingus ASSR) Torgim, 1180 m, 4–7.VIII.1988, leg. B. Herczig, K. Szeőke & Z. Mészáros (21 males, OPC).

*Diagnosis.* Most close to *Drusus botos* Oláh, 2017 described from Turkey, but differs by having paramere with less inflated paramere head and without pronounced subapical constriction. The mesal arm of the bilobed fused complex cercal structure, that is the setaless fused dorsal arm of the paraproct is even more robust, especially in lateral view with very obliquely truncate

tip. The neutral periphalllic organ of the gonopod is longer.

*Description.* Light brown animal with forewing length of 12 mm. Having inflated paramere terminal section, piliferous-tomentose-pubescent paramere surface and recumbent primary and secondary paramere spines, it belongs to the *Drusus caucasicus* species group. The plate-shaped setose cercus is fused to the digitiform setaless mesal process of paraproct origin, a character combination of the *Drusus caucasicus* species complex (Oláh et al. 2017).

*Etymology.* Coined from the name of the type locality.

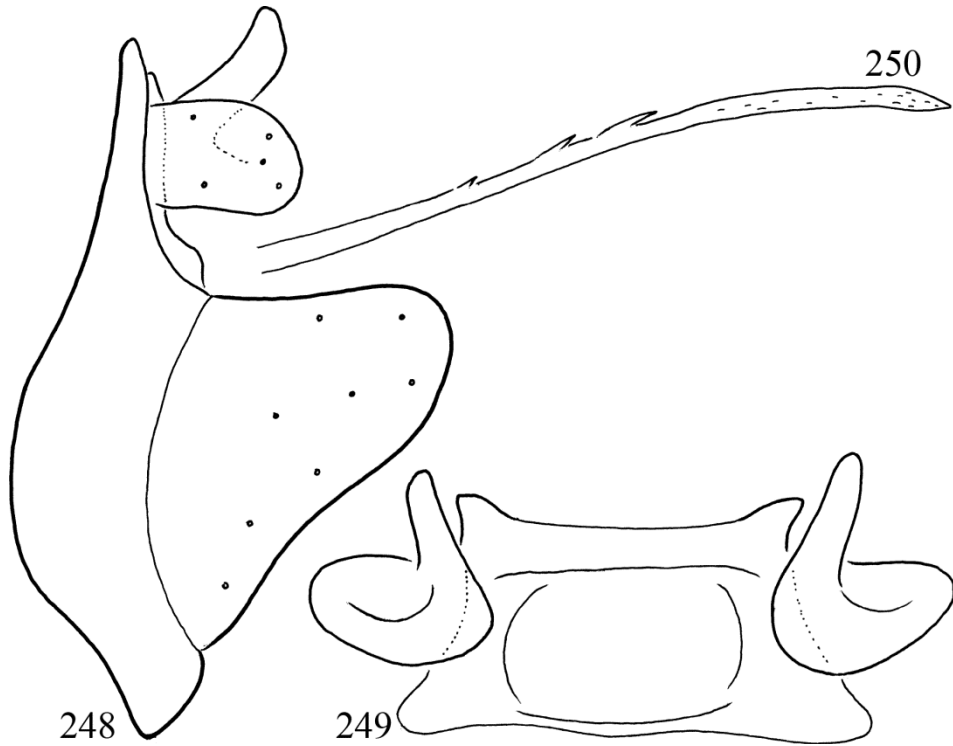
***Drusus csupasz* Oláh, sp. nov.**

(Figures 251–253, Map 13, Photo 14)

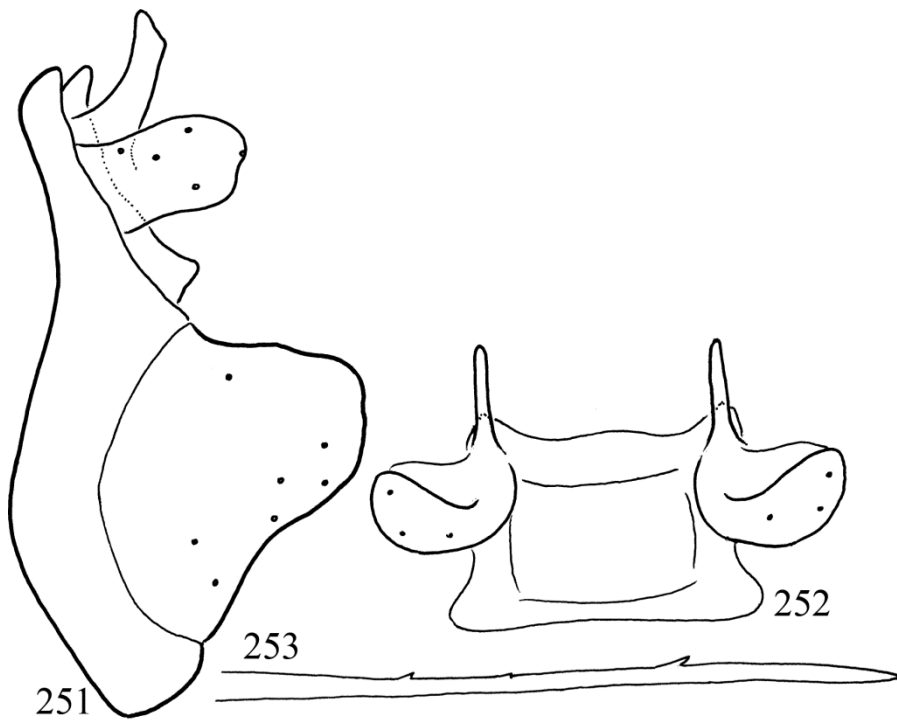
*Material examined.* Holotype: **Georgia**, Mtskheta-Mtianeti region, Sno, Snostskali River at Sno Castle 1770m, N42°36.306' E44°38.290' 13.VII.2019, dry specimen from spider web, leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (1 male, OPC). Paratype: same as holotype (1 male, OPC). Mtskheta-Mtianeti region, Sno, karst stream below (N of) the village N42°36.937' E44°37.640', 1765m, 12.VII.2019, leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (1 male, OPC).

*Diagnosis.* Most close to *Drusus baksan* Oláh, 2017 but differs by having very thin and slender paramere with smooth bare surface without any tomentose texture and the paramere terminal section not inflated and without any subapical constriction; the primary spine less developed and the two secondary spines anterad of the primary spine present; few tertiary spines discernible. The mesal arm of the bilobed fused complex cercal structure, that is the setaless fused dorsal arm of the paraproct is flat sagittally, arching in lateral view, but not pointing, rather with obliquely truncate tip; straight, not S-shaped in caudal view. The neutral periphalllic organ of the gonopod is rather short and rounded, not upward directed elongated triangular of *D. baksan*.





Figures 248–250. *Drusus chechensis* Oláh, sp. nov. Holotype: 248 = male genitalia in left lateral view, 249 = the fused paraproct cercal complex in caudal view, 250 = paramere in lateral view.



Figures 251–253. *Drusus csupasz* Oláh, sp. nov. Holotype: 251 = male genitalia in left lateral view, 252 = the fused paraproct cercal complex in caudal view, 253 = paramere in lateral view.

*Description.* Light brown animal with forewing length of 10 mm. Having typical architecture of the genitalia and recumbent primary and secondary paramere spines belongs to the *Drusus caucasicus* species group. The plate-shaped setose cercus is fused to the digitiform setaless mesal process of paraproct origin, a character combination of the *Drusus caucasicus* species complex (Oláh et al. 2017).

*Etymology.* csupasz, coined from “csupasz” smooth, bare in Hungarian, refers to the surface of the paramere without any tomentose texture.

*Remarks.* The bare surface of the paramere shaft is a chimeric item in this species complex characterised by piliiferous-tomentose-pubescent paramere surface. It is a secondary feature resulted by the loss or by the “sleeping” of genetic complex responsible for the integration of tomentose surface texture. The single paratype has larger size, differently shaped gonopods and piliiferous-tomentose paramere surface. More specimens are required to understand deviations between holotype and paratypes as well as the stabilities of their identical cercal and paraproctal structures.

***Drusus johansonii* Oláh, sp. nov.**

(Figures 254–256, Map 13)

*Material examined.* Holotype: **Georgia**, Gvelethi near Kazbek, N42°42'17.3" E044°37'15.7", 1644 m, 16.V.2012, light trap leg. O. Kurina (1 male, SMNH). Paratypes: same as holotype (associated females: 2 females, SMNH; 1 female, OPC).

*Diagnosis.* Most close to *Drusus chechensis* sp. nov. described here from Chechnia but differs by having paramere with several small tertiary spines on the basal half of the paramere shaft. The mesal arm of the bilobed fused complex cercal structure that is the setaless fused dorsal arm of the paraproct is robust and shorter in lateral view and without obliquely truncate tip. The neutral periphallial organ of the gonopod is subquad-rangular in lateral view not gradually rounding

ventro-subapical. The neutral cerci much higher almost circular, not low and elongated.

*Description.* Light brown animal with forewing length of 16 mm. This large-sized *Drusus* having inflated paramere terminal section, piliiferous-tomentose-pubescent paramere surface and recumbent primary and secondary paramere spines belongs to the *Drusus caucasicus* species group. The plate shaped setose cercus is fused to the digitiform setaless mesal process of paraproct origin, a character combination of the *Drusus caucasicus* species complex (Oláh et al. 2017).

*Etymology.* Named for Kjell Arne Johanson, our colleague working on caddisflies, in honour of his generous support to our studies on Trichoptera.

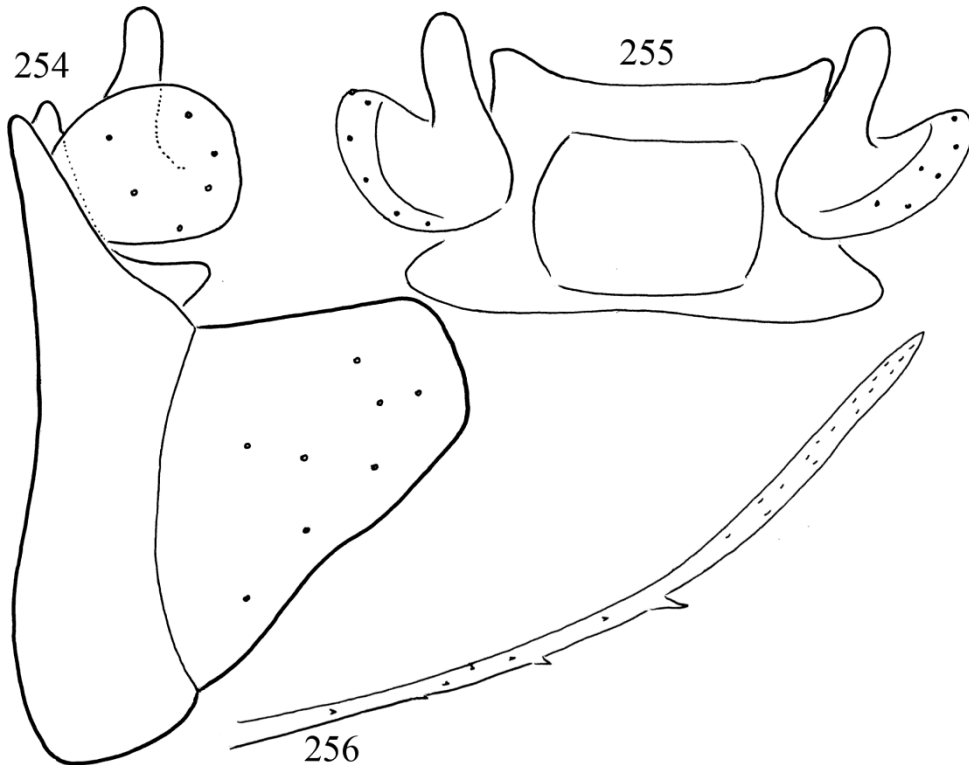
***Drusus simplex* species complex**

In this species complex, the setaless dorsal arm of the paraproct is shifted dorsolaterad and produced into abbreviated or elongated variously shaped knobby structure. Paramere terminal section inflated and usually rather tomentose. With routine structure analysis all the specimens from the Caucasus and from Iran has been determined earlier as *Drusus simplex* (Schmid 1956, Kumanski 1980b). Applying the fine structure analysis of speciation trait we have detected stable and consistent divergences in the structure of the paraproct and paramere directly involved in copulation processes and we have realised that there are multitude of undiscovered species in this complex in various isolated mountain ranges (Oláh et al. 2017). *Drusus megnot* sp. nov. is the first species of the *Drusus simplex* complex discovered in Georgia.

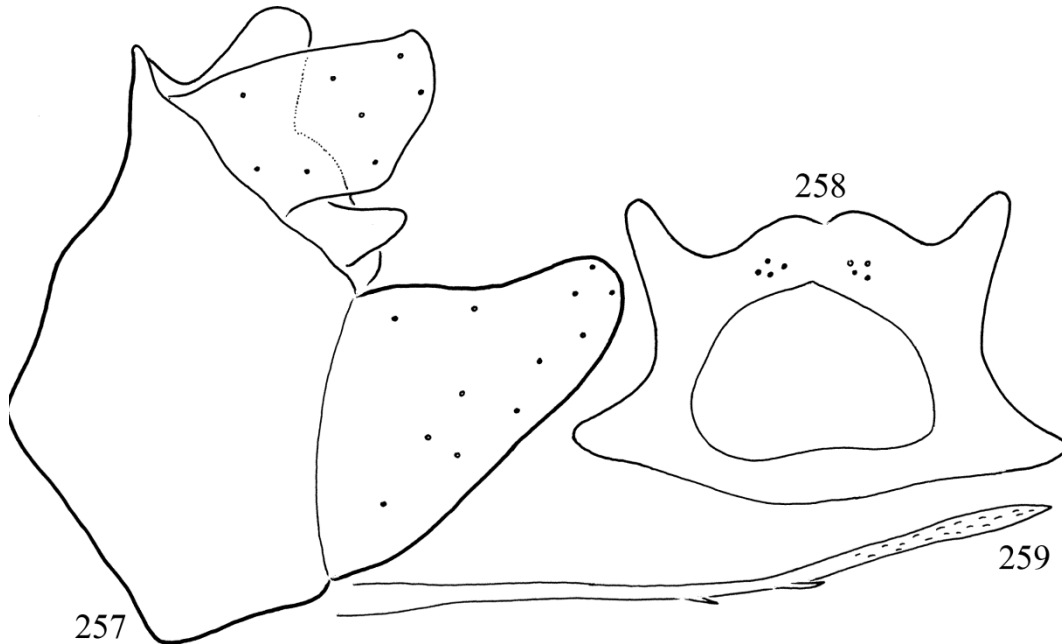
***Drusus megnot* Oláh & Vinçon, sp. nov.**

(Figures 257–259, Map 13, Photos 15–16)

*Material examined.* Holotype: **Georgia**, Kakheti region, above Lechuri, in direction of Omalo, big torrent above the bridge, tributary of Stori Aragvi River, 42°12'19"N, 45°27'45"E, 880m, 3.X.2019, leg. G. Vinçon (1 male, OPC).



Figures 254–256. *Drusus johansoni* Oláh, sp. nov. Holotype: 254 = male genitalia in left lateral view, 255 = the fused paraproct cercal complex in caudal view, 256 = paramere in lateral view.



Figures 257–259. *Drusus megnot* Oláh & Vinçon, sp. nov. Holotype: 257 = male genitalia in left lateral view, 258 = paraproct in caudal view, 259 = paramere in lateral view.

*Diagnosis.* Most close to *Drusus hassankif* Oláh, 2017 described from Mazatlan, Iran but differs by having anterior margin of segment IX triangular, not rounded; gonopods longer; dorsal arm of paraproct shorter; caudal profile of the paraproct complex differently shaped, almost as high as wide, not low; paramere terminal section similarly inflated and tomentose, but the two principal spines on paramere more developed and close to each other; tertiary spines lacking, top of the inflated paramere terminal section without any top modification.

*Description.* Light brown animal with forewing length of 13 mm. Belongs to species with elongated dorsal arm of the paraproct.

*Etymology.* *megnot*, coined from “megnött” elevated, got higher in Hungarian, refers to the high caudal profile of the quadratic paraproct complex.

***Drusus mankoi* Oláh, sp. nov.**

(Figures 260–266, Map 13, Photos 45–46)

*Material examined.* Holotype: **Azerbaijan**, Gədəbəy district, Qualakənd, tributary of the Şemkirçay r., big stream S of the village, N40°27.218' E45°43.045', 1520m, 1.X.2019, leg. P. Manko (1 male, OPC). Allotype: Azerbaijan, Gədəbəy district, Qualakənd, forest brook S of the village, N40°27.370' E45°43.123', 1510m, 1.X.2019, leg. P. Manko (1 female, OPC).

*Diagnosis.* Most close to *Drusus polur* Oláh, 2017 described from Mazatlan, Iran but differs by having dorsal arm of paraproct more robust, especially in caudal view; caudal profile of the paraproct complex differently shaped; paramere terminal section between the primary spine and the paramere tip is similarly inflated and tomentose, the primary spine is well-produced, not modified into an elevated step; tertiary spine lacking, top of the inflated paramere terminal section without any top modification. There are significant divergences in the female genital

structure, even more distinct than at male genital divergences. The anal tube is much longer; the pointed tip on the lateral lobes of the anal tube is very produced and accompanied with special apical marginal pattern, lacking at *D. polur*.

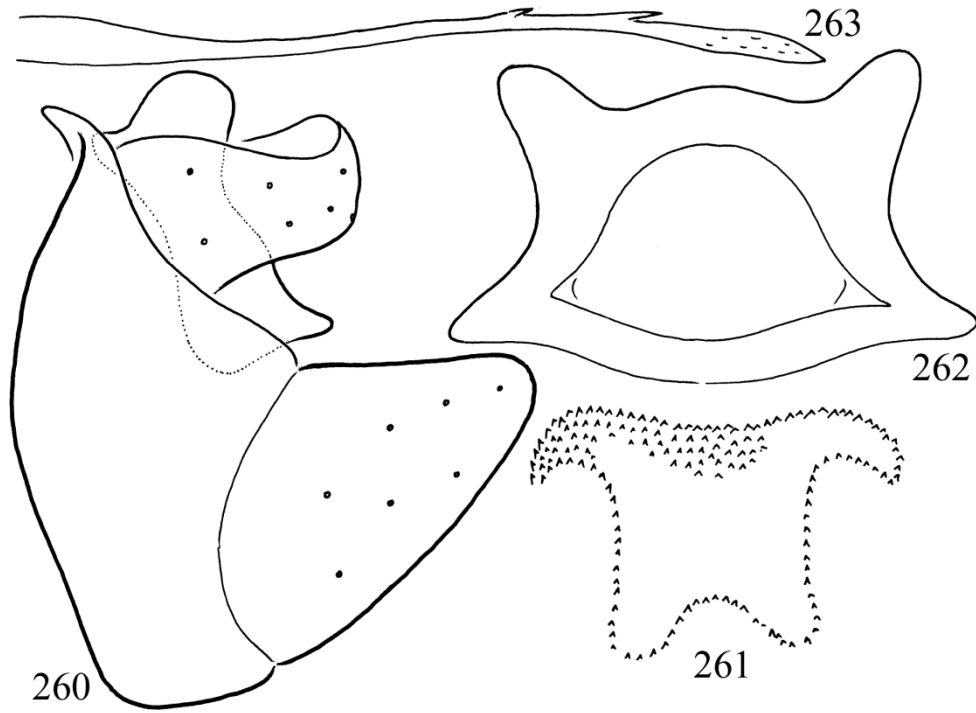
*Description.* Light brown animal with forewing length of 10 mm. Belongs to species with abbreviated dorsal arm of the paraproct.

*Female genitalia.* Tergite of segment IX forming long tube, open ventrally, with double V-shaped mesal excision; lateral lobes with elongated pointed tip in dorsal view; this middle position elongated tip is accompanied by pronounced steps; the lateral setose lobe of sternite IX rounded elongate. Segment X membranous and embedded inside segment IX and encircling anus; supragenital plate of segment X well-developed and quadrangular in lateral view with middle excised lateral margin. Median lobe of the vulvar scale (lower vaginal lip) present and long parallel-sided. Dorsal profile of the vaginal sclerite complex almost parallel-sided anterad.

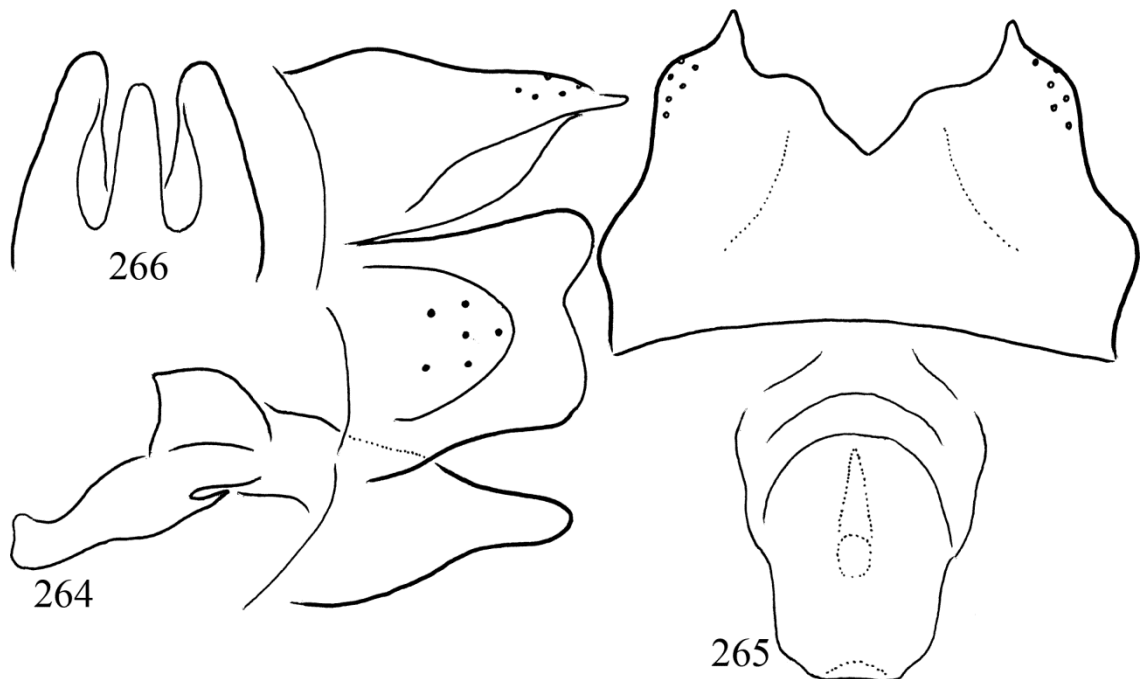
*Etymology.* This new species was dedicated to the collector Peter Manko, who has taken all the heavy administrative duties as the leader of the International Visegrad Fund Project devoted to exploring the aquatic insect life of the Caucasus.

***Drusus budtzi* species group**

The character state transformation in the *Drusus budtzi* species group is integrated through ancestral divergence by shifting all the spines to the very tip of the paramere and as a consequence the apical shaft of the paramere which is preserved and present in all of the other species groups has been lost in this group. The single organising centre of the spine pattern is shifted to the very terminal position on the paramere. *Drusus budtzi* species group is comprised of two known species: *budtzi* of Corsica, Sardinia; *maculosus* of the Caucasus, Abkhazia Mts. Georgia (Oláh et al. 2017). Here we describe a new species, *Drusus janjulae* from low altitude in the Imereti Region of Georgia.



Figures 260–263. *Drusus mankoi* Oláh, sp. nov. Holotype: 260 = male genitalia in left lateral view, 261 = spinose pattern on tergum VIII. 262 = paraproct in caudal view, 263 = paramere in lateral view.



Figures 264–266. *Drusus mankoi* Oláh, sp. nov. Allotype: 264 = female genitalia in left lateral view, 265 = the fused tergum IX and segment X with the vaginal sclerite complex in dorsal view, 266 = vulvar scale (lower vaginal lip) in ventral view.

***Drusus janjulae* Oláh, sp. nov.**

(Figures 267–270, Map 13, Photos 6–7)

*Material examined.* Holotype: **Georgia**, Imereti Region, karst torrent in deciduous forest, N42°27.405' E42°35.948', 310 m, 16.IX.2018, leg. Murányi et al. (1 male, OPC).

*Diagnosis.* Having gigantic parameres, distally dilated aedeagus and vertical plan of the gonopods this interesting species belongs to the small *Drusus budtzi* species group. This unique group represents an independent lineage in the genus with great character state transformations initiated by drastic stochastic impacts and created during the integrative organisation. The enlargement of paramere shaft is coupled with the shift of spine organising centre to the paramere terminal. The basic architectural plan of the genitalia is identical with the *D. maculosus* Malicky & Oláh, 1979, but the periphallic organs of cerci, paraproct and gonopod diverged and the paramere is highly modified with its scale covered surface and with the vertically flattened body.

*Description.* Medium-sized animal with yellowish, stramineous body and wing colour. Its forewing length is 10 mm. Segment IX short and high parallel-sided with sudden narrowing dorsad resulted in a very short band-like dorsum. Cerci downward directed ovoid setose plate basally connected to the paraproct. The dorsal branch of the paraproct composed of an apical pair of heavily sclerotized black laterad arching lobes visible in caudal view and a setose dorsal region having putative cercal origin. Gonopods almost vertical directed with more developed dorsal and less produced ventral regions. Phallic organ has a robust aedeagus with dilated head and a pair of vertically flat enlarged paramere armed with apical group of thick spines and covered, tightly packed on the distal half with elongated and decumbent fine scales of sharp tip.

*Etymology.* We name this unique *Drusus* species by coining “*Jancsi and Juliska*”, the name of the ancestral couple of the popular tale and the name of the first author’s couple to remember

their long-lasting productive caddisfly cooperation in living together.

*Remarks.* The gigantic paramere is only one of the several ancestral paramere divergences in the *Drusus* genus: (1) basal fuse of parameres in the *D. tenellus* species group; (2); paramere enlargement in the *D. budtzi* species group; (3) complete loss of spines of setal origin in the *Drusus alpinus* species group; (4) miniaturization or abbreviation of the paramere in the *D. chauviniana* species group; (5) complete loss of paramere in the *D. torosensis* species group (Oláh et al. 2017).

**Limnephilinae**

**Limnephilini**

***Glyphotaelius selysii* McLachlan, 1869**

*Material examined.* **Georgia**, Imereti region, Meskheti range, Sairme, brook in mixed forest, N41°52.994' E42°45.333', 1270m, 17.IX.2018, leg. D. Murányi et al. (1 female, OPC).

***Limnephilus affinis* Curtis, 1834**

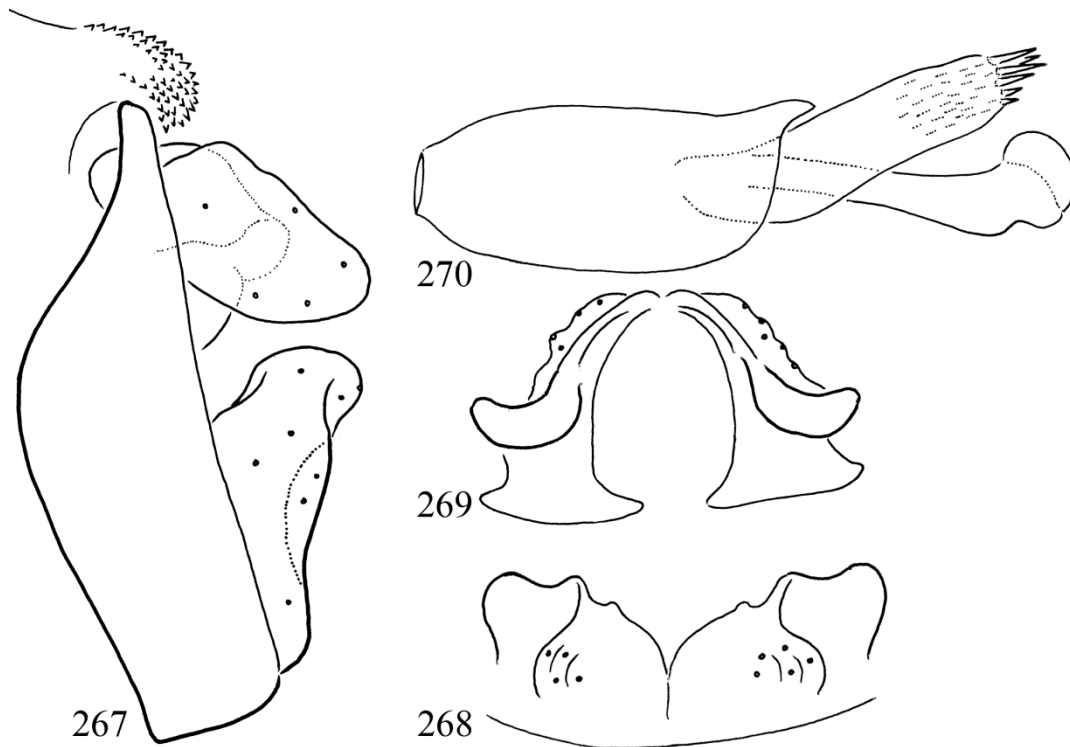
*Material examined* **Azerbaijan**, Göygöl district, Göygöl N.P., forest brook below Maralgöl Lake, N40°22.855' E46°18.507', 1875m, 30.IX.2019, leg. T. Kovács, P. Manko, D. Murányi (2 males, 8 females, OPC). **Georgia**, Adjara, Taidzeebi, Shavitketskali Stream, N41°39.516' E42°08.232', 445m, 25.IX.2019, leg. T. Kovács, P. Manko, D. Murányi (2 males, 6 females, OPC).

***Limnephilus bipunctatus* Pictet, 1834**

*Material examined.* **Georgia**, Samtskhe-Javakheti region, Aspara, open brook W of the village, N41°27.549' E43°44.738', 2320m, 14.VII.2019, leg. T. Kovács, D. Murányi & G. Vinçon (3 males, 1 female, OPC).

***Limnephilus hirsutus* Pictet, 1834**

*Material examined.* **Georgia**, Kakheti region, Gombori pass, NE the pass, spr. + br. muddy, 41°51'16"N, 45°17'06"E, 1450 m, 8.VII.2019, leg. G. Vinçon (1 male, 1 female, OPC).



**Figures 267–270.** *Drusus janjulae* Oláh, sp. nov. Holotype: 267 = male genitalia in left lateral view, 268 = paraproct in dorsal view. 269 = paraproct in caudal view, 270 = phallic organ in lateral view.

***Limnephilus microdentatus* Martynov, 1913**

*Material examined.* **Azerbaijan**, Göygöl district, Göygöl N.P., Göygöl Lake, N40°24.887' E46°19.660', 1570m, 30.IX.2019, leg. T. Kovács, P. Manko, D. Murányi (1 female). Azerbaijan, Göygöl district, Göygöl N.P., Maralgöl Lake, N40°22.731' E46°18.750', 1920m, 30.IX.2019, leg. T. Kovács, P. Manko, D. Murányi (1 female, OPC). **Georgia**, Adjara, downflow of the Mtsvane Tba (Green Lake), N of Goderdzi Pass, N41°40'41.49" E42°29'54.69", 2055m, 27.IX.2019, leg. T. Kovács (1 female, OPC).

***Limnephilus ponticus* McLachlan, 1898**

*Material examined.* **Azerbaijan**, Siyazan District, Galaalty village, N41°5'6.732" E 48°56'30.8508", 714m, 10.VI.2019, on light trap, leg. I. Kerimova (1 male, OPC).

***Limnephilus sparsus* Curtis, 1834**

*Material examined.* **Georgia**, Mtskheta-Mtianeti region, Juta, upper brook towards the Pass, N42°33.582' E44°47.783', 2900m, 11.VII.2019, leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (1 male, OPC). Georgia, Mtskheta-Mtianeti region, Juta, open springbrooks above (E of) the village, N42°34.474' E44°45.249', 2340m, 11.VII.2019, leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (1 male, OPC). Georgia, Mtskheta-Mtianeti region, above Juta, spring and brook in the Chaukhistskali Valley, 42°34'30"N, 44°45'35"E, 2500m, 30.IX.2019, leg. G. Vinçon (1 male, 1 female, OPC). Georgia, Mtskheta-Mtianeti region, Juta, open springbrooks above (E of) the village, N42°34.474' E44°45.249', 2340m, 11.VII.2019, leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (2 males, OPC).

***Limnephilus vittatus* (Fabricius, 1798)**

*Material examined.* **Georgia**, Samtskhe-Javakheti region, Paravani River below Saghamo Lake, N41°17.588' E43°43.726', 2015m, 14.VII.2019 leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (1 male, OPC). **Georgia**, Samtskhe-Javakheti region, Epremovka, Kochki River below Madatapa Lake, N41°11.271' E43°45.033', 2115 m, 14.VII.2019, leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (1 male, OPC).

***Sakala* Oláh & Vinçon, gen. nov.**

*Taxonomic history.* *Limnephilus peculiaris* McLachlan, 1875 was described from the Caucasus (Gouriel) based upon a single male from the collection of De Selys-Longchamps. According to the description, it was a peculiar animal and McLachlan was uncertain about its generic position where to place while hesitating between aberrant *Limnephilus* or aberrant *Stenophylax*. The most pronounced unique character states emphasized by McLachlan were the side-pieces of segment IX as well as the lack or doubtful presence of the paraproct. Both character states are unique in the entire Limnephilidae family. We have collected one male and five females from Adjara of Georgia with similar generic, but with different specific characters, and based upon this new species available for study we give a generic rank to these taxa.

In spite of the *Stenophylacini* habitus the setose bilobate paramere relates clearly this new genus to the Limnephilini tribe. An additional taxon was drawn by Malicky (1983) in his European Atlas of Trichoptera from an unknown locality, without any information, but probably from Turkey, under the name of *Limnephilus peculiaris* may represent the third species of *Sakala* gen. nov.

*Diagnosis.* Small sized animal with *Stenophylacini* habitus: (1) forewing is broad, not elongated; (2) forewing termen is convex, not truncate or concave; (3) brachyptery tendency present in female, not absent; (4) genitalic struc-

tures are not robust. However, the bilobate heavily setose ancestral, plesiomorphic state of paramere is clearly a character state of the phallic organ in the Limnephilini tribe (Oláh et al. 2019b).

The generic ranking of the *Sakala* gen. nov. in the Limnephilini tribe is established mostly by the almost completely reduced state of the vestigial paraproct. In the Limnephilini tribe only the genus *Lepnevaina* Wiggins, 1987 has a certain degree of paraproct reduction however, *Sakala* gen. nov. has different character combination in five out of the eight genital substructures: apomorphic spinulose tergite eight, not plesiomorphic; plesiomorphic setose state of cerci, not heavily sclerotized, apomorphic; separate, free from each-other (plesiomorphic) state of dorsal branch of paraproct, not fused apomorphic; reduced (apomorphic) state of the ventral branch of paraproct, not plesiomorphic; separate free from each-other (plesiomorphic) state of the ventral branches of paraproct, not fused (apomorphic).

Besides these divergences in the eight genital substructures the new genus *Sakala* lacks the prominent ovoid setal cephalic wart on the head frons, the so much distinctive structure of *Lepnevaina* genus as well as females of the new genus brachypterous, a unique character in the Limnephilini tribe. The main character state transformation creating the genus ranking of *Sakala* gen. nov. is the paraproct reduction that is more pronounced than at the *Lepnevaina* genus, the only other genus in the Limnephilini tribe with vestigial paraproct. The paraproct complex of the new genus is more vestigial; it is reduced to a pair of mesally well separated vertically elongated less sclerotized setose bands; its ventral fourth is setaless. The other unique character state transformation has been realised by integrative organisation initiated under a great perturbation event: segment IX produced this unique subdorsal pair of posterad directed heavily sclerotized processes of hook formation. The new genus *Sakala* is characterized by the habitual feature of the elongated, posterad directed setae on the genital structures of cerci and gonopods.



*Paraproct reduction in Limnephilidae* family. In the Limnephilini tribe only *Lepnevaina* has reduced state of paraproct that is represented by a pair of medially fused, flat, setose, less sclerotized plates, this virtual disappearance of paraproct was considered unique in Limnephilinae subfamily (Wiggins 1987). However, in the *Chilostigma*, *Chilostigmodes*, *Desmona* genera of the Chilostigmini tribe of Limnephilinae subfamily the paraproct are poorly developed, vestigial, reduced to two slightly sclerotized, virtually flat setose lobes fused together mesally (Schmid 1998). Moreover, the paraproct of *Ecclisopteryx* genus of the Drusinae subfamily of the Limnephilidae family has almost completely disappeared, reduced to a pair of narrow sclerotized bands shifted ventrad deep between the enlarged cercal complex and the phallobase. The stimulatory function of the lost paraproct at the *Ecclisopteryx* genus has been taken over by the modified head of the gonopods (Oláh et al. 2017).

*Genital character state combinations.* Character polarization of eight genital substructures for character combination (Oláh et al. 2017) may help to realise a comparative analysis with the related limnephiline genera. (1) Presence (apomorphic) of spinulose protuberance on tergite VIII; (2) Reduced (apomorphic) state of tergite IX; (3) Setose inerm (plesiomorphic) state of cerci; (4) Reduced (apomorphic) state of the dorsal branch of paraproct; (5) Separate free from each-other (plesiomorphic) state of the dorsal branch of paraproct; (6) Separate free-from-cerci (plesiomorphic) state of the dorsal branch of paraproct; (7) Reduced (apomorphic) state of the ventral branch of paraproct; (8) Separate free from each-other (plesiomorphic) state of the ventral branches of paraproct.

*Type species.* *Sakala adjarica* sp. nov.

*Etymology.* *Sakala* from “szakál”, “szakállas” beard, bearded in Hungarian refers to the unique elongated posterad directed setae dominating the genitalia.

***Sakala adjarica* Oláh & Vinçon, sp. nov.**

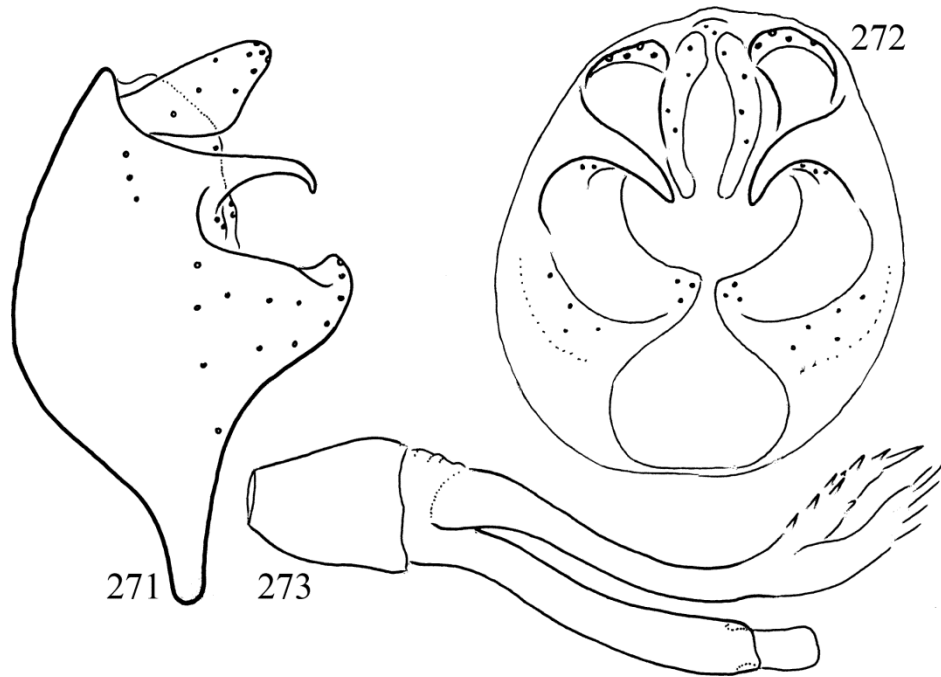
(Figures 271–276, Map 14, Photos 29, 31)

*Material examined.* Holotype: **Georgia**, Adjara region, brook and spring, after Goderdzi Pass, after Beshumi Botanic Garden, Dzindzitskali tributary N41°37'17" E42°32'16", 1970m, 16.VII.2019, leg. G. Vinçon (1 male, OPC). Allotype: same as holotype (1 female, OPC). Paratypes: same as holotype (4 females, OPC).

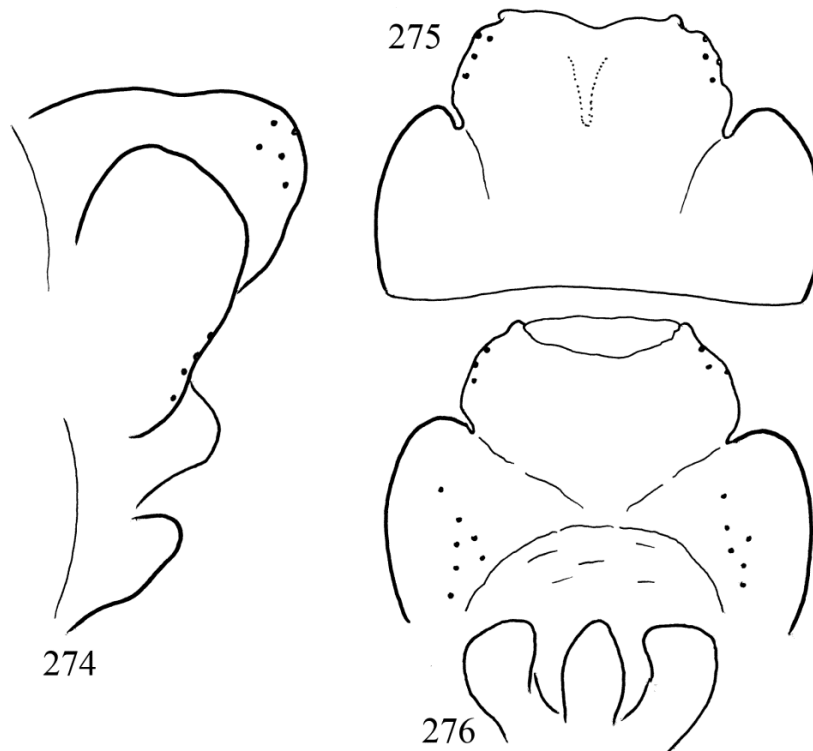
*Diagnosis.* Having no access to the single male (McLachlan 1875: Georgia, Gouria) and to the later described and drawn single female of *Limnephilus peculiaris* McLachlan, 1876 (Asia Minor: Trebizond: probably Turkey, Trabzon) as well as to the redrawn *Limnephilus peculiaris* of unknown origin (Malicky 1983: probably from Turkey) we had to rely upon the original descriptions and drawings. The new species differs from all the descriptions and drawings either in the structure of the paramere as well as in the structure of the female genitalia. However, more specimens and from all of the three localities are required to establish a more detailed status of the species in the new genus *Sakala*.

*Description.* Male (in alcohol). Head and thoracic sclerites, as well as antennae, labial and maxillary palps and femurs are variously yellowish brown; maxillary palp segments yellow, legs yellowish. Antennae are rather stout. Spur number 134 both in male and females, holotype male has only 2 apical spurs present on the left hind leg, 2 preapical spurs lacking. Forewing membrane light brown, covered with small thin setae in recumbent position; forewing veins armed with upright erected strong setae; forewing length 9 mm.

*Male genitalia.* The spinulose apicomedian zone on tergite VIII is poorly developed, but present and represented by pigmentless mesal lobe scattered with thin and short setae, not covered with peg-like spines. The lateral profile of segment IX and the fused gonopod are very particularly shaped; characterized with very short



Figures 271–273. *Sakala adjarica* Oláh & Vinçon, sp. nov. Holotype: 271 = male genitalia in left lateral view, 272 = male genitalia in caudal view, 273 = phallic organ in lateral view.



Figures 274–276. *Sakala adjarica* Oláh & Vinçon, sp. nov. Allotype: 274 = female genitalia in left lateral view, 275 = the fused tergum IX and segment X in dorsal view, 276 = female genitalia with vulvar scale (lower vaginal lip) in ventral view.

sternal region, rounded convex anterad, and subtriangular posterad and has a very unique character, a subdorsal pair of posterad directed heavily sclerotized processes of hook formation. This is unique in the entire family of Limnephilidae. Cerci large subtriangular characterized by long undulating setae directed posterad. Paraproct is poorly discernible, reduced vestigial, represented by a pair of vertical bands setose dorsad, setaless bare on the very ventral part. Gonopods completely fused to segment IX, subtriangular with blunt mesad turning apices. Phallic organ is composed of the phallosome, endotheca, aedeagus, endophallus and the paramere. Aedeagus is a simple tube with well discernible endophallus, protruded apicad.

*Female* (in alcohol). Forewing membrane brown, covered with small thin setae in recumbent position; forewing with brachyptery tendency, forewing tip is just surpassing the abdomen. Spur number is 134. Head and thoracic sclerites as well as antennae, labial and maxillary palps and femurs are yellowish-brown.

*Female genitalia*. Tergite IX forming a tube together with the less sclerotized tergite X encircling anus; the sternite of segment IX heavily sclerotized, dominating on the entire female genitalia. Supragenital plate of sternum X is less developed forming a rounded less sclerotized lobe. Median lobe of the vulvar scale (lower vaginal lip) is as long as the lateral lobes.

*Etymology*. Named after the region of the locus typicus, Adjara, a biodiversity hotspot in the Lesser Caucasus of Georgia.

***Sakala peculiaris* (McLachlan, 1875) comb. nov.**

(Map 14)

*Limnephilus peculiaris* McLachlan, 1875:98–99. “Caucasus (Gouriel). One ♂ in very good condition in the collection of DE Selys-Longchamps.” “Intermediate appendages (paraproct) doubtfully present. Side-pieces of 9<sup>th</sup> ventral segment very peculiar, large; anteriorly each is produced into a long, strong, black spine, the apex curved downward.” “I should have placed this insect among the aberrant species of *Stenophylax*.”

*Limnephilus peculiaris* McLachlan, 1875: McLachlan 1876:7. A ♀ Asia Minor (Trebizond? T. Deyrolle), in De Selys’ collection,” “The ♀ agrees almost entirely with the ♂, but is slightly larger.”

*Limnephilus peculiaris* McLachlan, 1875: Sipahiler & Malicky 1987:139. Turkey, Artvin, Borcka, Karagöl, 22.VIII.1983, 1♀.”

*Limnephilus peculiaris* McLachlan, 1875: Malicky 1983:194. A male was drawn without any information about the origin of the specimen.

**Chaetopterygini**

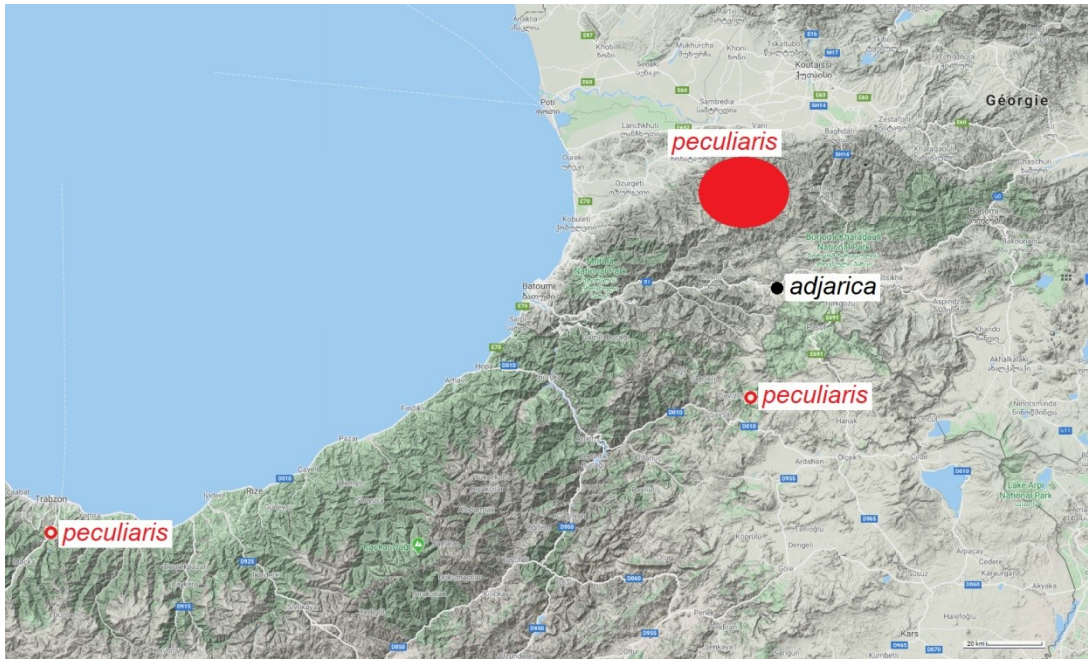
***Badukiella* Mey & Müller, 1979**

This small Caucasian genus was described without original differential diagnosis. No formal delineation has been given. Its relation to the poorly known genus *Psilopterna* Martynov was suggested to be examined (Mey & Müller 1979). In this small monobasic genus, two species have been described: *Badukiella prohibita* Mey & Müller, 1979, the type species of the genus and *B. subnigra* Oláh, 1985. Here we describe two new species: *B. kinula* sp. nov and *B. kurta* sp. nov.

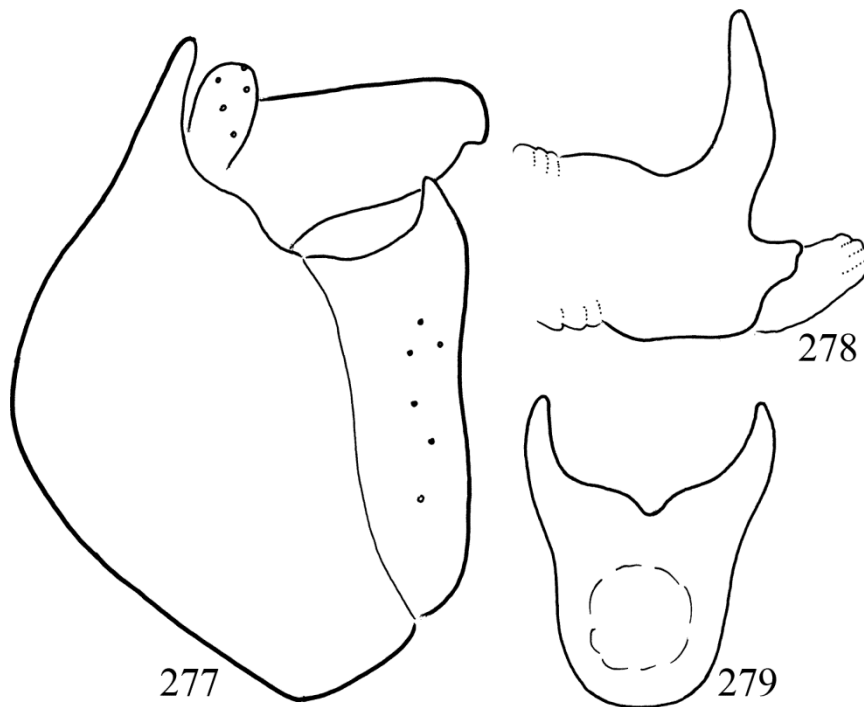
***Badukiella kinula* Oláh & Vinçon, sp. nov.**

(Figures 277–282, Map 15, Photo 12)

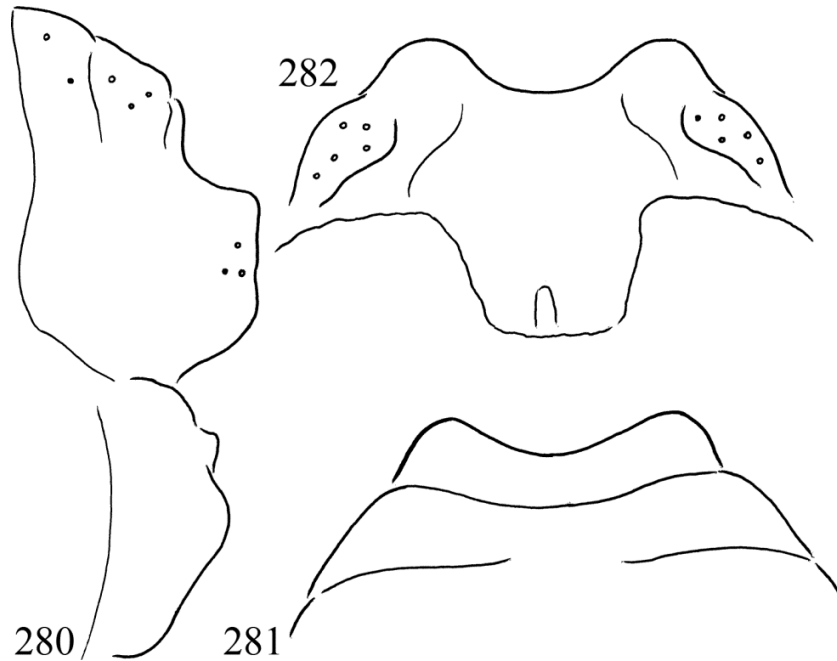
*Material examined*. Holotype: **Georgia**, Mtskheta-Mtianeti region, Tibistskali Stream above its mouth to Terek River, 42°42’36”N, 44°37’36”E, 1440m, 2.X.2019, leg. G. Vinçon (1 male, OPC). Allotype: same as holotype (1 female, OPC). Paratypes: same as holotype (16 males, 5 females, OPC; 2 males, 1 female, NMPC). Georgia, Mtskheta-Mtianeti region, above Juta, Chaukhistskali River and small tributaries, 42°34’04”N, 44°45’28”E, 2400m, 30.IX.2019, leg. G. Vinçon (2 males, 1 female, OPC). Georgia, Mtskheta-Mtianeti region, 2 springs with mosses, in the High Juta Valley, 42°34’27”N, 44°48’34”E, 2550m, 1.X.2019, leg. G. Vinçon (1 male, OPC). Georgia, Mtskheta-Mtianeti region, Sno Castle, small river with dense riparian vegetation, tributary of Snostskali River, 42°36’18”N, 44°38’17”E, 1780m, 1.X.2019, leg. Vinçon (5 males, 1 female, OPC).



Map 14. Distribution of *Sakala* gen. nov. (full circle represents the type locality)



Figures 277–279. *Badukiella kinula* Oláh & Vinçon, sp. nov. Holotype: 277 = male genitalia in left lateral view, 278 = aedeagus in lateral view. 279 = aedeagus in caudal view.



**Figures 280–282.** *Badukiella kinula*, Oláh & Vinçon, sp. nov. Allotype: 280 = female genitalia in left lateral view, 281 = female genitalia in dorsal view, 282 = female genitalia in ventral view.

**Diagnosis.** This new species is close to *Badukiella kurta* sp. nov., but differs by having longer segment IX, and differently shaped sclerotized phallic structure. The dorsoapical horns slender and arching but longer compared to the body of the sclerotized phallic structure as well as the paraproct is much longer and lower.

**Description.** Male (in alcohol). Very dark small species with almost black body sclerites and with brownish-testaceous wings. Forewing with moderately rounded apex very long erect spine-like setae present both on the membrane and on the veins; setae on the veins usually stronger. Tibial spur number 022 at male and 122 at female. Forewing length 6 mm.

**Male genitalia.** Protuberance of spinate area of vestitural noncellular microtrichia lacking. Segment IX long, longer ventrally than dorsally; very short strap or bridle-like dorsally. Segment X partly fused to basal region of cerci. Cerci small, ovoid. Paraproct forms a pair of heavily sclerotized, black, elongated horizontal plates with blunt apex broadening on the ventrum from subapicad. Gonopods abbreviated triangular in

lateral view. Phallic organ is rather specialised composed of a fused, short, heavily sclerotized tube with a pair of dorsoapical horns and with membranous endophallus protruding from a ventroapical circular opening.

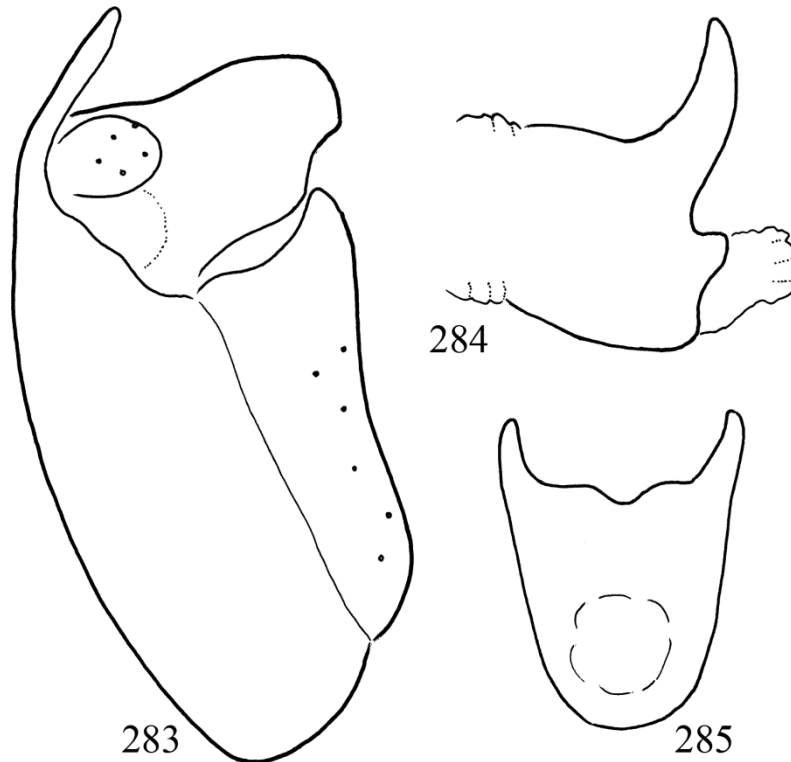
**Female genitalia.** There is a closed “anal tube” formed by the complex of the variously fused tergite IX and segment X. Setose sternite IX connected by less glabrous mesal plate, this ventral surface, the supragenital plate functions as the upper vaginal lip. Segment X forms a close tube ending its dorsum shallowly excised. The lower vaginal lip, the vulvar scale is membranous badly visible.

**Etymology.** *kinula*, coined from “kinyúlt” protruding, stretching in Hungarian refers to the short paraproct and to the short dorsoapical horns on the fused sclerotized phallic structure.

***Badukiella kurta* Oláh & Vinçon, sp. nov.**

(Figures 283–285, Map 15, Photos 39, 41)

**Material examined.** Holotype: **Georgia**, Samtskhe-Javakheti region, brooklet in grassy land,



**Figures 283–285.** *Badukiella kurta* Oláh & Vinçon, sp. nov. Holotype: 283 = male genitalia in left lateral view, 284 = aedeagus in lateral view. 285 = aedeagus in caudal view.

tributary of Borjomula River, above Bakuriani, 41°42'34"N, 43°30'28"E, 2070m, 29.IX.2019, leg. G. Vinçon (1 male, OPC). Paratype: Georgia, Samtskhe-Javakheti region, spring and brooklet in grassy land, tributary of Borjomula River, above Bakuriani, 41°41'35"N, 43°31'02"E, 2270–2350 m, 29.IX.2019, leg. G. Vinçon (1 male, OPC). Georgia, Imereti region, steep brook and spring above the road, north slope of Zekari pass, Kershaveti tributary, 41°50'45"N, 42°48'31"E, 2150–2200m, 28.IX.2019, leg. G. Vinçon (2 males, OPC).

*Diagnosis.* This new species is close to *Badukiella subnigra* Oláh, 1985 described from South Ossetia, but differs by having shorter segment IX, and differently shaped sclerotized phallic structure: dorsoapical horns slender and arching anterad, not robust and straight. The dorsoapical horns are slender and arching also at *B. kinula* sp. nov., but *B. kurta* sp. nov. has shorter horns compared to the body of the sclerotized

phallic structure as well as much shorter and higher paraproct.

*Description.* Male (in alcohol). Very dark small species with almost black body sclerites and with brownish-testaceous wings. Forewing with moderately rounded apex very long erect spine-like setae present both on the membrane and on the veins; setae on the veins usually stronger. Tibial spur number 022. Forewing length 6 mm.

*Male genitalia.* Protuberance of spinate area of vestitural noncellular microtrichia lacking. Segment IX short, longer ventrally than dorsally; very short strap or bridle-like dorsally. Segment X partly fused to basal region of cerci. Cerci small, ovoid. Paraproct forms a pair of heavily sclerotized, black horizontal plates with blunt apex broadening on the ventrum from subapicad. Gonopods abbreviated triangular in lateral view. Phallic organ is rather specialised composed of a fused, short, heavily sclerotized tube with a pair of dorsoapical horns and with membranous en-

dophallus protruding from a ventroapical circular opening.

*Etymology.* kurta, from “kurta” short in Hungarian refers to the short paraprot and to the short dorsoapical horns on the fused sclerotized phallic structure.

***Badukiella prohibita* Mey & Müller, 1979**

(Map 15)

*Material examined.* Paratype: **Russia**, Baduk, Teberda, West Caucasus, 13.X.1978, leg. W. Mey & A. Müller (1 male, MNG).

*Remarks.* According to the collectors *Badukiella prohibita*, the type species of the genus is distributed in the entire Teberda valley between 1200 and 1800 m.

***Badukiella subnigra* Oláh, 1985**

(Map 15)

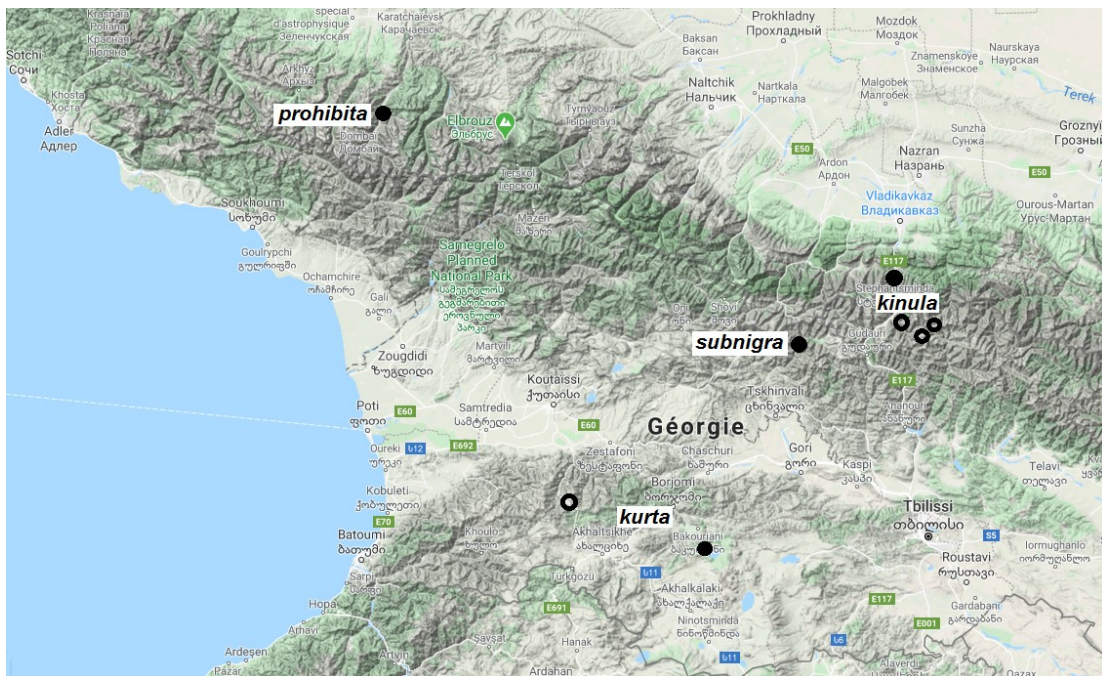
*Badukiella subnigra* Oláh 1985:150–151. “This species is very close to the only known species of this

genus *B. prohibita* Mey et Müller. There are, however, well-defined differences in the structure of the genitalia. The parameres have no heel-like ventral corner which is so visible on the drawing by Mey and Müller. The aedeagus is very short and not so membranous, retractile and long as in *B. prohibita*. In apical aspect the upward directed parameres are robust not tapering and not curving outwards so much as the more slender parameres in *B. prohibita*. Inferior appendages produce only one well-defined apex.”

*Badukiella prohibita* Mey & Müller 1979: Malicky 2005:572. *B. subnigra* synonymised with *B. prohibita* without any justification or explanation.

*Badukiella subnigra* Oláh, 1985: Oláh et al. 2019:52. We have re-examined and compared the aedeagus and its speciation trait component of the strongly enlarged and heavily sclerotized pairs of dorsal process and it was clearly diverged. Here we reinstate its species status.

*Material examined.* Holotype: Caucasus, Georgia, Yugo-Osetinskaya A. O., Vaneli Mountain with a peak of 3196 m, northwest of the capital Tbilisi and south of the chains of Great Caucasus, valley of River Liakhvi, 23.X.1956, leg. Gorodkov. Vaneli is a village in the Java District of



Map 15. Distribution of *Badukiella* species (full circles represent the type localities)

South Ossetia. It is located on the right bank of Greater Liakhvi river, at an altitude of 1,310 m (1 male, ZIL).

***Chaetopteryx abchazica* (Martynov, 1916)**

*Material examined.* **Azerbaijan**, Göygöl district, Göygöl N.P., forest brook below Maralgöl Lake, N40°22.855' E46°18.507', 1875m, 30.IX.2019, leg. T. Kovács, P. Manko, D. Murányi (1 female, OPC). **Azerbaijan**, Gədəbəy district, Gədəbəy, open brook and seep S of the village, N40°27.602' E45°43.144', 1480m, 1.X.2019, leg. T. Kovács, P. Manko, D. Murányi (1 male, OPC). **Georgia**, Adjara, open brook N of Goderdzi Pass, N41°39.728' E42°30.315', 2155m, 27.IX.2019, leg. T. Kovács & D. Murányi (1 male, 2 females, OPC). **Georgia**, Adjara, steep brook in spruce forest E of Goderdzi Pass, N41°38.000' E42°33.474', 1790m, 27.IX.2019, leg. T. Kovács & D. Murányi (1 male, OPC; 1 male, 1 female, MM). **Georgia**, Adjara, Beshumi, seeps, brooks and stream in open forest, N41°37.356' E42°32.329', 1940m, 27.IX.2019 leg. T. Kovács, P. Manko, D. Murányi, & G. Vinçon (1 male, 1 female, OPC). **Georgia**, Mingrelia and High Svanetia region, brooklet and spring NW above the camping place, Nakra valley, Utviri tributary, 43°04'49" N, 42°19'41"E, 2300-2500m, 23.IX.2019, leg. G. Vinçon (1 male, 1 female, OPC). **Georgia**, Imereti region, muddy spring left side lateral to the brook, Tsablarastskali tributary, 41°52'11"N, 42°47'40"E, 1670m, 28.IX.2019, leg. G. Vinçon (1 male, 2 females, OPC). **Georgia**, Samtskhe-Javakheti region, brooklet in grassy land, tributary of Borjomula River, above Bakuriani, 41°42'34"N, 43°30'28"E, 2070m, 29.IX.2019, leg. G. Vinçon (2 males, 3 females, OPC). **Georgia**, Mtskheta-Mtianeti region, Tibistskali Stream above its mouth to Terek River, 42°42'36"N, 44°37'36"E, 1440m, 2.X.2019, leg. G. Vinçon (1 male, OPC). **Georgia**, Mtskheta-Mtianeti region, Dariali, lateral small spring in the Khde River valley above the dam, 42°43'54"N, 44°38'40"E, 1610m, 2.X.2019, leg. G. Vinçon (10 males, 6 females, OPC). **Georgia**, Samtskhe-Javakheti region, spring and brooklet in grassy land, tributary of Borjomula River, above Bakuriani, 41°41'35"

N, 43°31'02"E, 2270-2350m, 29.IX. 2019, leg. G. Vinçon (2 male, 3 females, OPC). **Georgia**, Mtskheta-Mtianeti region, spring and brook in grass land, W Gergeti Trinity Church, upwards the farm, 42°39'48"N, 44°36'07"E, 2200-2300m, 2.X.2019, leg. G. Vinçon (1 male, 3 females, OPC). **Georgia**, Samtskhe-Javakheti region, brooklet in forest with a lot of aquatic vegetation, tributary of Borjomula River, above Bakuriani, 41°43'56"N, 43°30'26"E, 1780m, 29.IX.2019, leg. G. Vinçon (1 female, OPC). **Russia**, Caucasus, Okr. Lors, Tereksoj Obl., 8.VIII.1920, leg. M. Rjadov (1 male, 1 female, OPC).

***Chaetopteryx vinconi* Oláh & Kovács, sp. nov.**

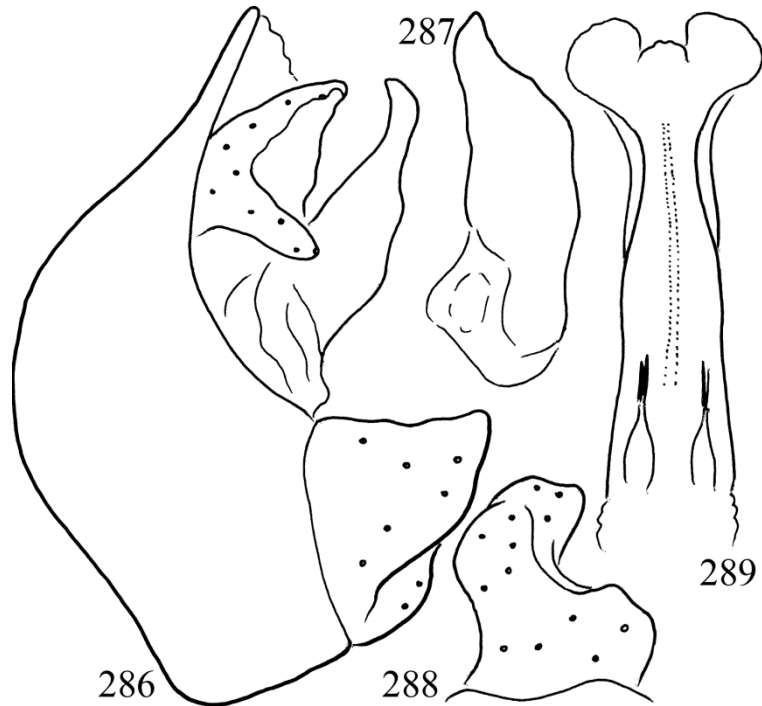
(Figures 286–292, Map 16, Photos 23–24)

*Material examined.* Holotype: **Georgia**, Adjara, Kintrishi Nature Reserve, above Khino, spring of Kintrishi River and brook, 41°45'31" N, 42°06'50"E, 2300m, 26.IX.2019, leg. G. Vinçon (1 male, OPC). Allotype: same as holotype (1 female, OPC). Paratypes: same as holotype (3 males, 4 females, OPC; 1 male, 1 female, MM; 1 male, 1 female, NMPC).

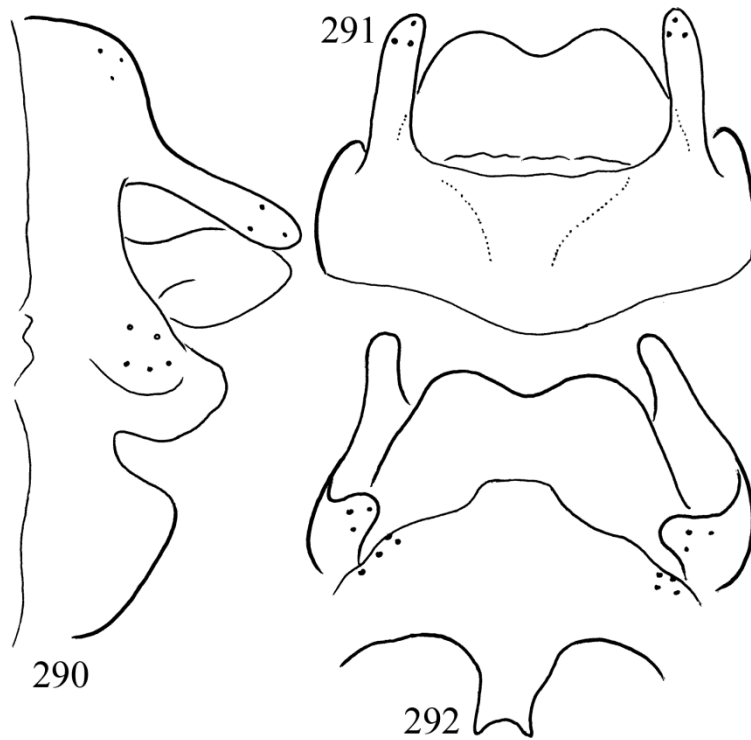
*Diagnosis.* This unique new *Chaetopteryx* species is very close to *Chaetopteryx aproka* Oláh described form near the Rodna mountain ranges of the Carpathian Mountains in northern Romania. Even the habitus, the small body size, the brachypterous wings and the extremely enlarged female abdomen are identical characters. Similarity is detectable also in the architecture of both the male and female genitalia. At male the cerci enlarged concave plate, dorsal branch of the paraproct elongated, aedeagus with bilobed head, parameres vestigial. At female the anal tube open. The new species differs by the abbreviated gonopod, by cerci with digitate dorsolateral apical lobe. Female differs by the much shorter supra-genital plate. The two species together represent a unique lineage in the *Chaetopteryx* genus having some relation to the *Chaetopteryx rugulosa* species group.

*Description.* Male (in alcohol). Pale testaceous small animal with pale testaceous body appen





**Figures 286–289.** *Chaetopteryx vinconi* Oláh & Kovács, sp. nov. Holotype: 286 = male genitalia in left lateral view, 287 = left paraprot in caudal view, 288 = gonopod in ventral view, 289 = phallic organ in dorsal view.



**Figures 290–292.** *Chaetopteryx vinconi* Oláh & Kovács sp. nov. Allotype: 290 = female genitalia in left lateral view, 291 = female genitalia in dorsal view, 292 = female genitalia in ventral view.



Map 16. Distribution of *Chaetopteryx* species (full circles represent the type localities)

dages and with pale yellowish-testaceous wings. Forewing with rounded apex and with tendency to brachyptery; very long erect spine-like setae present on both the membrane and the veins; setae on the veins usually stronger. Tibial spur number 033. Forewing length about 5 mm. Female (in alcohol) colour pattern is similar to the male. Length of forewing 4 mm. Brachyptery tendency even more pronounced than at male. Forewing shorter than the enlarged abdomen, probably unable to fly.

*Male genitalia.* Posterodorsal spinate area of vestitural noncellular microtrichia absent on tergite VIII. Segment IX long ventrally, very short strap or bridle-like dorsally; its lateral length elongated by rounded convexity anterad, enforced with well-developed antecosta. Segment X partly fused to tergite IX forming together the short dorsal bridle and partly present as less sclerotized membranous vestigium connecting mesad the less

sclerotized deeply invaginated basal part of the cup-like cerci. Cerci large and subquadrangular with posterolateral digitate lobe. Paraproctal complex with its upward-curving apices is the longest structure in lateral view; in caudal view the long dorsal branch running to the ventral branch and forming together a ventral triangle. Gonopods abbreviated triangle in lateral view broadening basomesad in ventral view. Phallic organ composed of large, mostly membranous aedeagus and short almost reduced and membranous just discernible parameres; apex of aedeagus with a pair of lateral wings; paramere shaft short armed with slim spines.

*Female genitalia.* There is no closed “anal tube” formed by the complex of the variously fused tergite IX and segment X. Tergite IX with long digitiform apicolateral processes dominating both in dorsal and lateral view, the processes are widely separated in dorsal view. Sternite IX

setose laterally and connected by glabrous large convex mesal plate, this glabrous ventral surface of sternite IX functions like the upper vaginal of a supragenital plate. Segment X represented by membranous dorsum just visible between the digitiform apicolateral processes of tergite IX and by the slightly sclerotized ventrum, the free flapping ventral plate; this ventral plate has concave roundly excised apical margin visible both in dorsal and ventral view; in lateral view the ventral plate of segment X visible as a broad rounded lobe. The open tubing function around the proctal opening of anus is realised by the membranous dorsum and the ventral plate of segment X. The lower vaginal lip, the vulvar scale is visible somewhat separated from sternite VIII by its more sclerotized structure, glabrous without any setae; its lateral lobes large rounded triangular, its mesal lobe small. Vaginal chamber is short, reaching only half length of sternite VIII.

*Etymology.* This unique species was dedicated in honour to the collector Gilles Vinçon, who is a devoted plecopterist and outstanding collector of seeps, springs, and spring streams in the sky island of high altitudes in isolated mountain ranges.

*Ecological remarks:* This species is probably strongly crenophilous. It occurs in the close surroundings of the springs of the Kintrishi River, in the highest part of the Kintrishi Nature Reserve. In the same highest part of this reserve also occurs a micro-endemic, apterous Plecoptera, *Leuctra khachapuri* Žiak & Martynov, 2019.

### ***Kelgena* Mey, 1979**

*Chaetopterygella* Martynov, 1916:195. Monobasic genus. Type species: *Chaetopterygella abchazica*.

*Chaetopteryx* Stephens, 1829. Schmid 1959:789. *Chaetopterygella* genus has been synonymized with the *Chaetopteryx* genus.

*Kelgena* Mey, 1979b:265–270. A new genus *Kelgena* was erected with the type species *Kelgena minima* Mey, 1979 including also *Chaetopteryx kelensis* (Martynov, 1926).

*Psilopterygopsis* Kumanski, 1980:153–155. A new genus *Psilopterygopsis* was erected for *Chaetopteryx kelensis* (Martynov, 1926) with the type species of

*Chaetopteryx kelensis*. In the last proof *Psilopterygopsis* was synonymised with *Kelgena*.

The taxonomic history of the Caucasian *Kelgena* genus has been started with the species *Chaetopterygella kelensis* Martynov, 1926. The monobasic *Chaetopterygella* genus was created by Martynov (1916), transferred to genus *Chaetopteryx* by Schmid (1959) and re-described as a new genus *Kelgena* by Mey (1979), based on the type species of *Kelgena minima* Mey, 1979, as well as almost synchronously re-described as a new genus *Psilopterygopsis* by Kumanski (1980a) based on type species of *Psilopterygopsis kelensis* (Martynov, 1926) with junior subjective synonymy, recognised already in the last proof. This small Caucasian genus is comprised of five species: *Kelgena minima* Mey, 1979 as type species, *K. kelensis* (Martynov, 1926), *K. macaheleensis* Sipahiler, 1999, *K. nehirae* Sipahiler, 2009, *K. sisensis* Sipahiler, 2009.

*Species group delineation.* Based on our recent collections and the discovery of nine new species just in Georgia we have recognised that the genus description that was based on *Kelgena minima* Mey, 1979b, as well as the later discovered and described new species of *K. nehirae* Sipahiler, 2009 and *K. sisensis* Sipahiler, 2009 represents taxa from the very periphery of the distributional area of the genus. The bulk of the *Kelgena* species collected on the larger distributional area in Georgia is characterized by different genital structure. Based on the structure of the male and female genitalia we have separated two species groups.

(1) *Kelgena minima* species group known only from the periphery of the distributional area and represented by three known species: *K. minima* Mey, *K. nehirae* Sipahiler, *K. sisensis*, Sipahiler. This species group is characterized by the broad and flat spinulose zone on male tergite VIII; by the fused paraproct (*Kelgena meyi* from the *Kelgena kelensis* species group has paraproct that seems not diverging in caudal view as emphasized in the original species description and visible on drawings), by the less distinct endothecal sclerites (*K. sisensis* exhibits some less pronounced sclerite as visible from the drawings); by the lack of deep,

almost halfcircular basal depression on female segment IX.

(2) *Kelgena kelensis* species group is represented by 11 species: *K. adjarica* sp. nov., *K. bakurianica* sp. nov., *K. bunka* sp. nov., *K. imeretica* sp. nov., *K. kelensis* (Martynov, 1926), *K. macahelensis* Sipahiler, *K. meyi* sp. nov., *K. parhuza* sp. nov., *K. svanetica* sp. nov., *K. tolaka* sp. nov., *K. topora* sp. nov. The species group is characterized by large, medially highly inflated convex spinulose zone with low lateral wings more densely packed with microtrichiae; by separated, not fused paraproct; by a pair of particularly pointed and movable endotheal sclerites; by the presence of deep, almost halfcircular basal depression on female segment IX.

*Species delineation.* We have selected seven genital characters to delineate taxa by character combination in this small genus:

(1) Spinulose protuberance or zone on male tergite VIII. Experienced rather stable at the examined 14 species. Species group of *K. minima* is characterized by the broad and flat spinulose zone. Species group of *K. kelensis* is characterized by large, medially highly inflated convex spinulose zone with low lateral wings.

(2) Lateral profile of the paraproct. Stable, but highly sensitive to slight modification of the examination angle. Very high (broad) (*K. svanetica*), very low (slender, slim) (*K. meyi*), but most species with moderately developed height; variously tapering and upward curving; with variously truncated or pointed apices.

(3) Lateral profile of the dorsal phallic sclerite. Single sclerite with deep apical excision and fixed sclerotically to the dorsum of aedeagus. After the paraproct the dorsal phallic sclerite is the second dominating structure of the phallic organ. In resting state its position is usually parallel with the paraproct, slightly shorter and usually slightly less robust. Usually slightly upward arching, seldom straight. Parallel-sided, tapering or seldom with clavate apices.

(4) Ventral profile of the dorsal phallic sclerite. Exclusively bilobed, variously excised mesally forming variously deep and wide, variously U-shaped or V-shaped excision with variously

stout or slender lateral lobes. Apices of the lateral lobes straight or variously mesad turning.

(5) Ventral profile of the pair of the endotheal sclerites. Usually triangular and pointed sclerites in axial coronal plane, more sclerotized on the apical tip and along the mesal edge. The transition of the sclerotized apicomeral region to the membranous endotheal region is indistinct. The size of the sclerites has diagnostic value. Contrary to the fixed dorsal phallic sclerite this paired sclerites are movable, depending on the ejection state of the endothea.

(6) Lateral view of the female anal tube. Lateral view of the structure of the closed anal tube seems to have diagnostic value. However there have been some flexible movements experienced between its more sclerotized part constituted mostly by segment X and its less sclerotized setose part constituted by tergite IX creating unknown ranges of infrapopulational variations in its lateral profile. There is an immense potential of fine phenomics to examine on large population samples the magnitude of flexibility of the apical margin of the lateral profile provided by the female anal tube.

(7) Dorsal view of the apicodorsal and apicoventral mesal excision of the anal tube. Especially the deeper apicodorsal excision seems stable with a certain range of variation.

*Taxonomic incongruences.* Like in any other hierarchies of living creatures there have been mostly incongruent character trees experienced for all the seven delineating characters. In spite of these taxonomic incongruencies, the concept and practice of the species tree or the tree of life are still a dominating scientific narrative in the western Darwinian epistemology. Trials to classify our newly discovered nine *Kelgena* species in Georgia, based just on these character states, clearly demonstrates again the chimeric nature of the speciation processes of an integrative organization. Due to taxonomic incongruences we have delineated the incipient sibling species in the *Kelgena kelensis* species group by the combination of the listed male and female genital characters.

***Kelgena adjarica* Oláh & Kovács. sp. nov.**

(Figures 293–314, Map 17, Photos 29, 31)

*Material examined.* Holotype: **Georgia**, Adjara, Beshumi, seeps, brooks and stream in open forest, N41°37.356' E42°32.329', 1940 m, 27.IX.2019, leg. T. Kovács & D. Murányi (1 male, OPC). Allotype: same as holotype (1 female, OPC). Paratypes: same as holotype (33 males, 3 females, OPC; 1 male, 1 female, MM; 4 males, NMPC). Georgia, Adjara, open brook in settlement E of Goderdzi Pass N41°38.057' E42°32.810', 1850m, 27.IX.2019, leg. T. Kovács & D. Murányi (2 males, 2 females, OPC). Georgia, Adjara, open brook N of Goderdzi Pass, N41°39.728' E42°30.315', 2155m, 27.IX.2019, leg. T. Kovács & D. Murányi (3 males, 1 female, OPC; 1 male, 1 female, MM). Georgia, Adjara, downflow of the Mtsvane Tba (Green Lake), N of Goderdzi Pass, N41°40'41.49" E42°29'54.69", 2055m, 27.IX.2019, leg. T. Kovács (1 male, OPC). Georgia, Adjara, steep brook in spruce forest E of Goderdzi Pass, N41°38.000' E42°33.474', 1790m, 27.IX.2019, leg. T. Kovács & D. Murányi (3 males, 2 females, OPC). Georgia, Samtskhe-Javakheti region, Utkisubani, waterfall towards Goderdzi Pass, N41°38.345' E42°34.976', 1660m, 27.IX.2019, leg. T. Kovács, P. Manko, D. Murányi, G. Vinçon (1 male, OPC).

*Diagnosis.* This new species distinguishable from all the other members of the genus by its character combination: (1) spinulose protuberance on tergite VIII is much enlarged, highly inflated mesad, like a ball with lateroventral wings. (2) Lateral profile of the paraproct elongated, high basad with tapering and upward arching blunt apex. (3) Lateral profile of the dorsal phallic sclerite. upward arching, regularly, but only slightly tapering. (4) Ventral profile of the dorsal phallic sclerite with V-shaped excision; its lateral lobes stout, with slightly tapering apices without pronounced mesad turning. (5) Pair of the endothelial sclerites small, only half the length of the mesal excision on the dorsal phallic sclerite. (6) Lateral view of the female anal tube with trilobed apical margin. (7) Dorsal view of the apicodorsal excision almost parallel-sided deeply

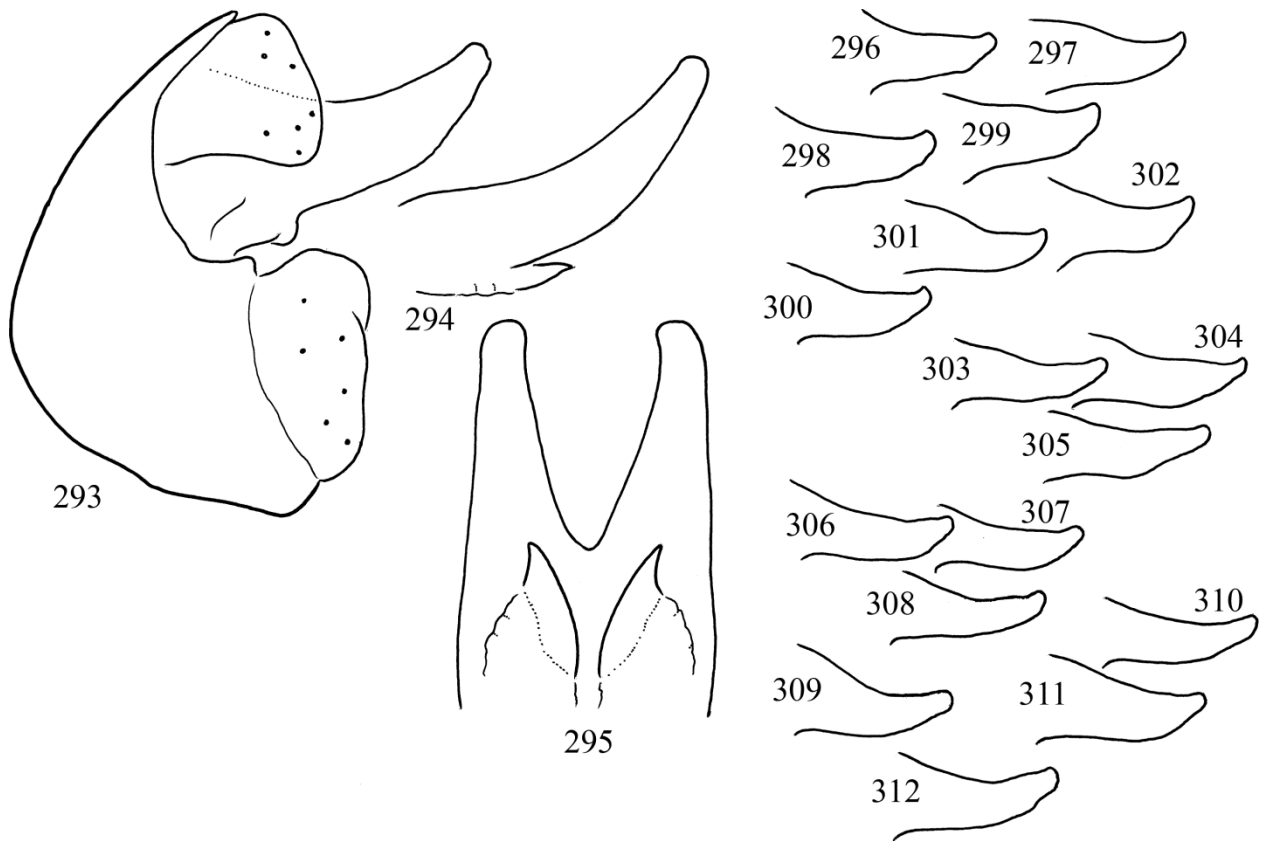
and narrowly excised; apicoventral mesal excision small, shallow half-circular.

Most close to *K. tolaka* sp. nov. described from Mtsvane Tba (Green Lake) Adjara, Georgia, but differs by having paraproct longer, not short, not abbreviated, with blunt apex; dorsal sclerite of aedeagus arching and tapering; the lateral profile of the anal tube with trilobed apical margin, not ventrad produced; the apical ventrum of the female anal tube with small mesal excision.

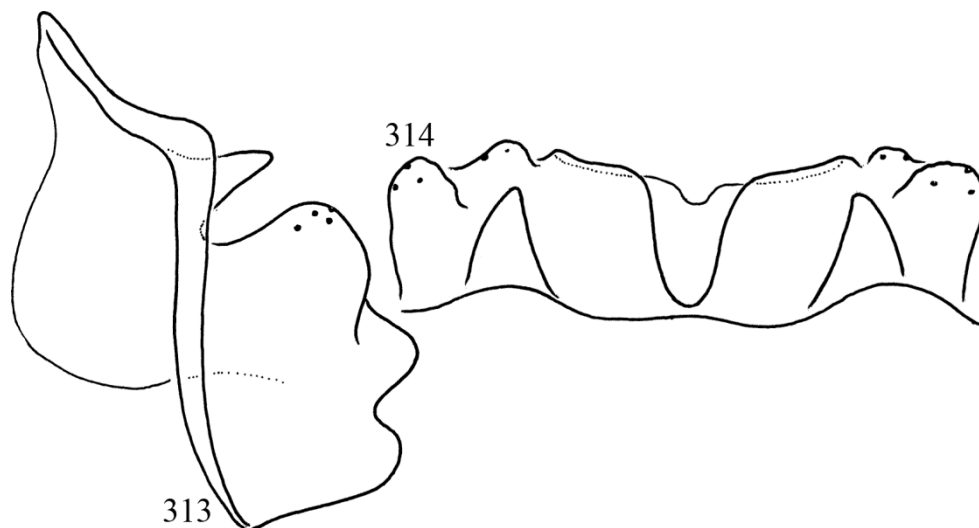
*Description.* Male (in alcohol). Yellowish pale brownish small species with pale testaceous body appendages and with pale yellowish-testaceous wings. Forewing with rounded apex and with tendency to brachyptery; forewing equal or variously shorter or slightly longer than abdomen, very long erect spine-like setae present both on the membrane and on the veins; setae on the veins usually stronger. Tibial spur number 033 at male. Forewing length 8 mm. Female colour pattern is similar to the male. Length of forewing 10 mm. Tibial spur 133. Brachyptery tendency even more pronounced than at male. Forewing shorter than the enlarged abdomen, unable to fly.

*Male genitalia.* Protuberance of spinulose area of vestitural noncellular microtrichia very enlarged, highly inflated mesad like a ball with lateroventral wings on tergite VIII, the lateroventral wings are more densely covered with small and short but elongated spicule-like structures. Segment IX longer ventrally; very short strap or bridle-like dorsally. Segment X partly fused to basal region of cerci forming together a short dorsal concavity. Cerci large and subtriangular. Paraproct forms a pair of heavily sclerotized horizontal elongated plates with tapering and upward arching blunt apex. Gonopods abbreviated subquadrangular in lateral view. Phallic organ composed of a dorsal plate heavily sclerotized, deeply V-shaped excised apically and a pair of shorter apicomeres sclerotized processes with laterad directed pointed apices.

*Female genitalia.* There is a closed “anal tube” formed by the complex of the variously fused tergite IX and segment X. Tergite IX forms a basal concavity strapped to the partially setose



**Figures 293–312.** *Kelgena adjarica* Oláh & Kovács, sp. nov. Holotype: 293 = male genitalia in left lateral view, 294 = aedeagus in lateral view, 295 = aedeagus in ventral view, 296–312 = lateral profile of paraproct at paratypes.



**Figures 313–314.** *Kelgena adjarica* Oláh & Kovács, sp. nov. Allotype: 313 = female genitalia in left lateral view, 314 = female genitalia in dorsal view.

sternite IX. Setose sternite IX connected by less glabrous mesal plate, this ventral surface, the supragenital plate functions like the upper vaginal lip. Segment X forms a closed tube; its apical dorsum very deeply and narrowly excised; its apical ventrum with only a small mesal excision. The lower vaginal lip, the vulvar scale is membranous, badly visible. Vaginal sclerite complex visible subquadrangular in dorsal view.

*Etymology.* The name was given from the regional name of the type locality, Adjara.

***Kelgena bakurianica* Oláh & Vinçon, sp. nov.**

(Figures 315–331, Map 17, Photos 39–41)

*Material examined.* Holotype: **Georgia**, Samtskhe-Javakheti region, spring and brooklet in grassy land, tributary of Borjomula River, above Bakuriani, 41°41'35"N, 43°31'02"E, 2270–2350m, 29.IX.2019, leg. G. Vinçon (1 male, OPC). Allotype: Georgia, Samtskhe-Javakheti region, brooklet in forest with a lot of aquatic vegetation, tributary of Borjomula River, above Bakuriani, 41°43'56"N, 43°30'26"E, 1780m, 29.IX.2019, leg. G. Vinçon (1 female, OPC). Paratypes: same as holotype (2 males, OPC). Georgia, Samtskhe-Javakheti region, brooklet in forest with a lot of aquatic vegetation, tributary of Borjomula River, above Bakuriani, 41°43'56"N, 43°30'26"E, 1780m, 29.IX.2019, leg. G. Vinçon (6 males, OPC; 2 males, NMPC). Georgia, Bakuriani, 6.X.1955, leg. J. Tasunov (2 males, 1 female; NMNHS). (3 males, OPC). Georgia, Samtskhe-Javakheti region, brooklet in grassy land, tributary of Borjomula River, above Bakuriani, 41°42'34"N, 43°30'28"E, 2070m, 29.IX.2019, leg. G. Vinçon (10 male, 1 female, OPC).

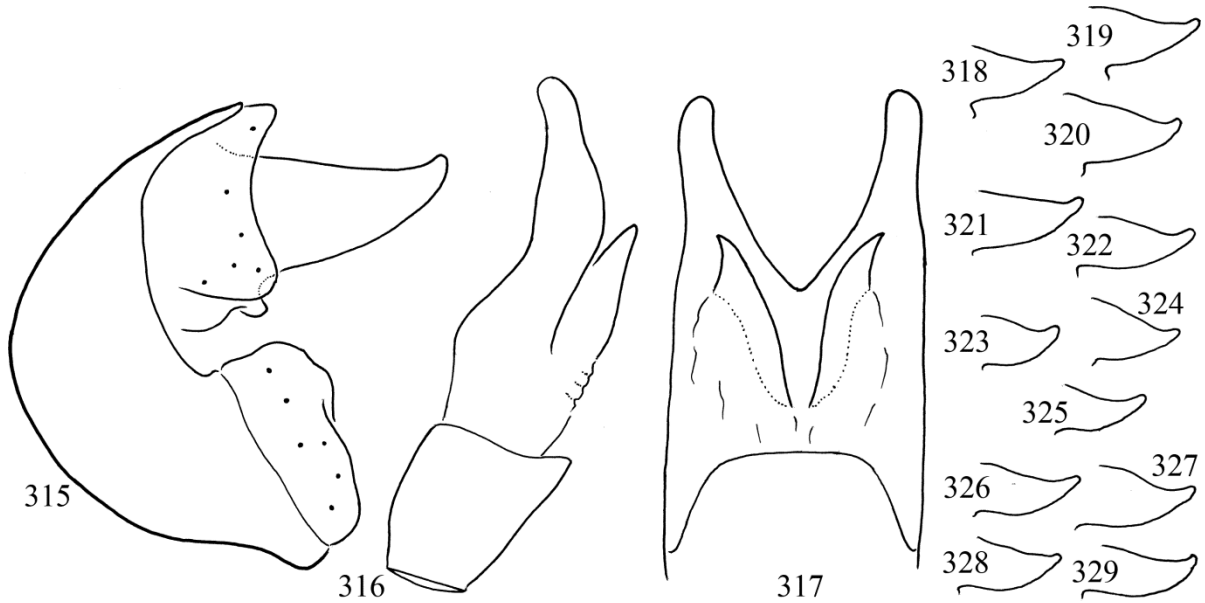
*Diagnosis.* This new species distinguishable from all the other members of the genus by its character combination: (1) spinulose protuberance on tergite VIII is much enlarged, highly inflated mesad, like a ball with lateroventral wings. (2) Lateral profile of the paraproct long triangular with upward curving and tapering apex. (3) Lateral profile of the dorsal phallic sclerite tripartite. (4) Ventral profile of the dorsal phallic sclerite

with wide V-shaped excision; its lateral lobes straight, without pronounced mesad turning. (5) Pair of the endothecal sclerites large, similar to the length of the mesal excision on the dorsal phallic sclerite. (6) Lateral view of the apical margin of female anal tube with pronounced, elongated ventral half. (7) Dorsal view of the apicodorsal excision very deep and narrow, almost parallel-sided; apicoventral mesal excision small, just discernible.

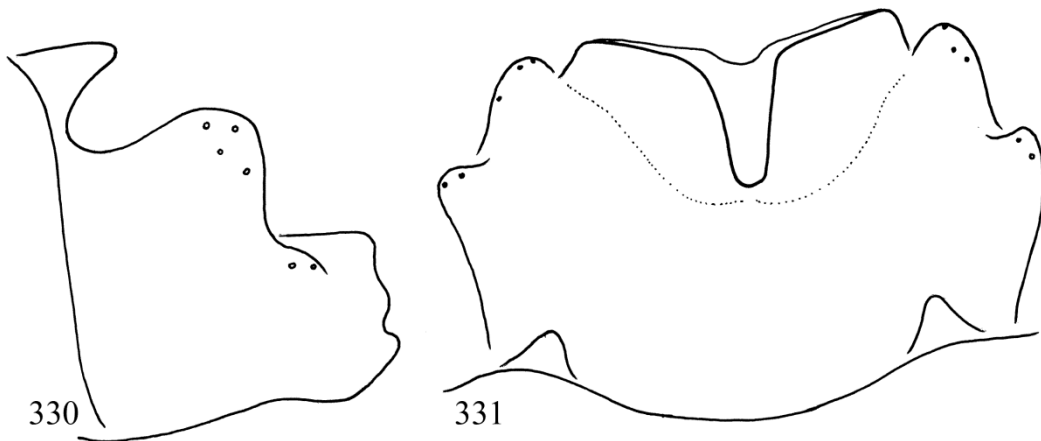
Most close to *K. kelensis* (Martynov) described from Lake Kel along the military road, Georgia. Differs by having paraproct shorter, with higher basal region; dorsal sclerite of aedeagus tripartite, gradually tapering not parallel-sided; the lateral profile of the anal tube with more produced ventral half; dorsal view of the apicodorsal excision on anal tube very deep and narrow, not widely opened V-shaped; apicoventral mesal excision small just visible, not pronounced.

*Description.* Male (in alcohol). Yellowish pale brownish medium-sized species with pale testaceous body appendages and with pale yellowish-testaceous wings. Forewing with rounded apex and with tendency to brachyptery; forewing equal or variously shorter or slightly longer than abdomen, very long erect spine-like setae present both on the membrane and on the veins; setae on the veins usually stronger. Tibial spur number 033 at male. Forewing length 6 mm. Female colour pattern is similar to the male. Length of forewing 9 mm. Tibial spur 133. Brachyptery tendency even more pronounced than at male. Forewing shorter than the enlarged abdomen, unable to fly.

*Male genitalia.* Protuberance of spinulose area of vestitural noncellular microtrichia very enlarged, highly inflated mesad, like a ball with lateroventral wings on tergite VIII, the lateroventral wings are more densely covered with small and short but elongated spicule-like structures. Segment IX slightly longer ventrally; very short strap or bridle-like dorsally. Segment X partly fused to basal region of cerci forming together a short dorsal concavity. Cerci large subtriangular. Paraproct forms a pair of heavily sclerotized elongated triangular plates with taper-



Figures 315–329. *Kelgena bakurianica* Oláh & Vinçon, sp. nov. Holotype: 315 = male genitalia in left lateral view, 316 = aedeagus in lateral view, 317 = aedeagus in ventral view, 318–329 = lateral profile of paraproct at paratypes.



Figures 330–331. *Kelgena bakurianica* Oláh & Vinçon, sp. nov. Allotype: 330 = female genitalia in left lateral view, 331 = female genitalia in dorsal view.

ing and upward turning tip. Gonopods abbreviated subquadrangular in lateral view. Phallic organ composed of a dorsal plate heavily sclerotized, deeply V-shaped excised apically and a pair of long apicomesally sclerotized processes with laterad directed pointed apices.

*Female genitalia.* There is a closed “anal tube” formed by the complex of the variously fused tergite IX and segment X. Tergite IX forms a basal concavity strapped to the partially setose

sternite IX. Setose sternite IX connected by less glabrous mesal plate, this ventral surface, the supragenital plate functions like the upper vaginal lip. Segment X forms a closed tube; its apical dorsum with a very deep and narrow, almost parallel-sided mesal excision; its apical ventrum with a small just discernible mesal excision. The lower vaginal lip, the vulvar scale is membranous, badly visible. Vaginal sclerite complex visible subquadrangular in dorsal view.



*Etymology.* The name was given from the regional name of the type locality, Bakuriani, Georgia.

***Kelgena bunka* Oláh & Vinçon sp. nov.**

(Figures 332–334, Map 17, Photos 37–38)

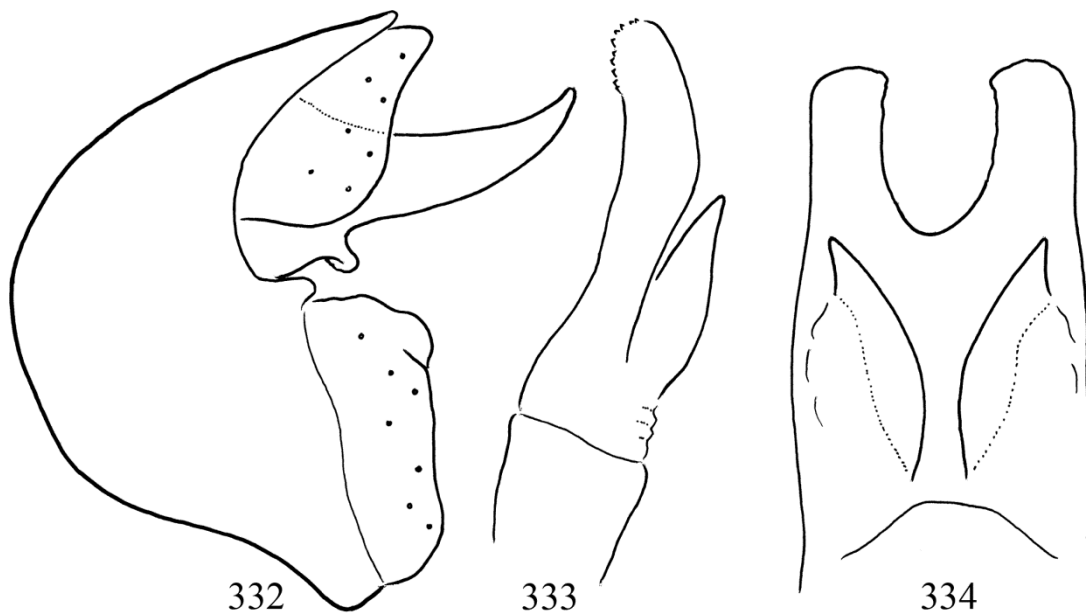
*Material examined.* Holotype: **Georgia**, Samtskhe-Javakheti region, Brook and spring, south slope of Zekari pass, 41°49'13"N 42°52'07"E, 2000–2050m, 28.IX.2019, leg. G. Vinçon (1 male, OPC).

*Diagnosis.* This new species distinguishable from all the other members of the genus by its character combination: (1) spinulose protuberance on tergite VIII is much enlarged, highly inflated mesad, like a ball with lateroventral wings. (2) Lateral profile of the paraproct long and slender triangular with significant upward curving and gradually tapering apex. (3) Lateral profile of the dorsal phallic sclerite clavate. (4) Ventral profile of the dorsal phallic sclerite with small U-shaped

excision; its lateral lobes rather robust, short and straight, without pronounced mesad turning. (5) Pair of the endotheal sclerites very large, longer than the length of the mesal excision on the dorsal phallic sclerite.

Most close to *K. imeretica* sp. nov. but differs by having paraproct slenderer, with concave dorsum and less blunt upward turning; dorsal sclerite of aedeagus clavate, not tapering; lateral lobes of the dorsal sclerites very short and even more robust, mesal excision shorter, U-shaped, not V-shaped.

*Description.* Male (in alcohol). Yellowish pale brownish medium-sized species with pale testaceous body appendages and with pale yellowish-testaceous wings. Forewing with rounded apex and with tendency to brachyptery; forewing equal or variously shorter or slightly longer than abdomen, very long erect spine-like setae present both on the membrane and on the veins; setae on the veins usually stronger. Tibial spur number 033 at male. Forewing length 6 mm.



**Figures 332–334.** *Kelgena bunka* Oláh & Vinçon, sp. nov. Holotype: 332 = male genitalia in left lateral view, 333 = aedeagus in lateral view, 334 = aedeagus in ventral view.

*Male genitalia.* Protuberance of spinulose area of vestitural noncellular microtrichia very enlarged, highly inflated mesad, like a ball with lateroventral wings on tergite VIII, the lateroventral wings are more densely covered with small and short but elongated spicule-like structures. Segment IX slightly longer ventrally; very short strap or bridle-like dorsally. Segment X partly fused to basal region of cerci forming together a short dorsal concavity. Cerci large subquadrangular. Paraproct forms a pair of heavily sclerotized elongated, slender triangular plates with tapering and upward turning tip. Gonopods abbreviated subquadrangular in lateral view. Phallic organ composed of a dorsal plate heavily sclerotized, deeply V-shaped excised apically and a pair of long apicomesally sclerotized processes with laterad directed pointed apices.

*Etymology.* *bunka*, coined from “bunkós” clavate in Hungarian, refers to the abbreviated and blunter, not tapering apex of the dorsal sclerite on the aedeagus.

***Kelgena imeretica* Oláh & Vinçon, sp. nov.**

(Figures 335–349, Map 17, Photos 34–35)

*Material examined.* Holotype: **Georgia**, Imereti region, steep brook and spring, north slope of Zekari pass, below Didmaghala Pic, Tsablarastskali tributary, 41°50'55"N, 42°47'43"E, 2080m, 28.IX.2019, leg. G. Vinçon (1 male, OPC). Allotype: Georgia, Imereti region, steep brook and spring above the road, north slope of Zekari pass, Kershaveti tributary, 41°50'45"N, 42°48'31"E, 2150–2200m, 28.IX.2019, leg. G. Vinçon (1 female, OPC). Paratypes: same as holotype (3 males, OPC). same as allotype (6 males, 1 female, OPC; 3 males, NMPC). Georgia, Samtskhe-Javakheti region, Brook and spring, south slope of Zekari pass, 41°49'13"N 42°52'07"E, 2000-2050 m, 28.IX.2019, leg. G. Vinçon (3 males, OPC).

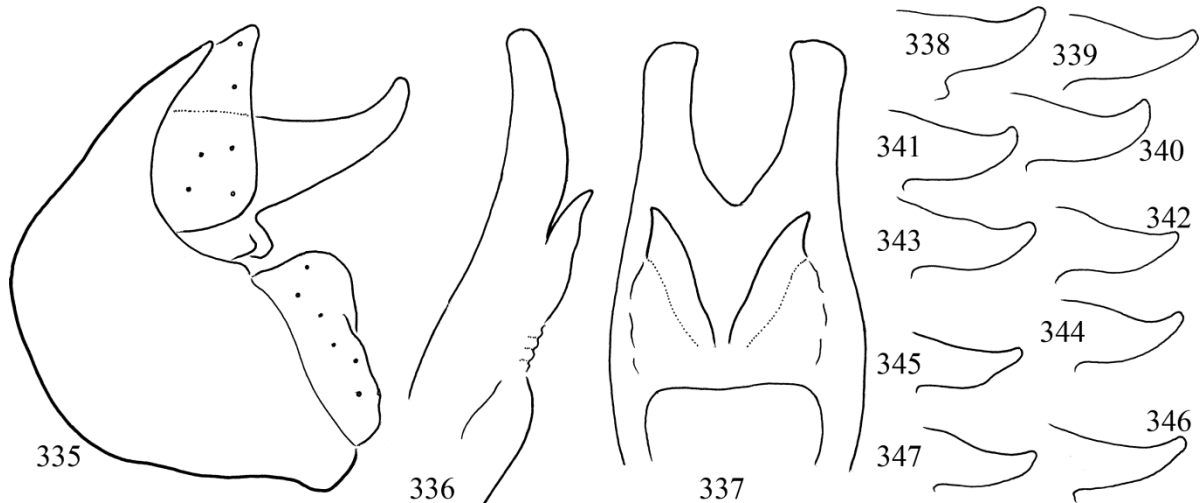
*Diagnosis.* This new species is distinguishable from all the other members of the genus by its character combination: (1) spinulose protuberance on tergite VIII is much enlarged, highly inflated mesad, like a ball with lateroventral wings. (2)

Lateral profile of the paraproct long triangular with significant upward curving and gradually tapering apex. (3) Lateral profile of the dorsal phallic sclerite slightly tapering and upward curving. (4) Ventral profile of the dorsal phallic sclerite with wide V-shaped excision; its lateral lobes rather robust and straight, without pronounced mesad turning. (5) Pair of the endothecal sclerites large, similar to the length of the mesal excision on the dorsal phallic sclerite. (6) Lateral view of the apical margin of female anal tube with pronounced, elongated ventral half, its apical margin rounded. (7) Dorsal view of the apico-dorsal excision very deep sharply V-shaped; apicoventral mesal excision deep subquadrangular.

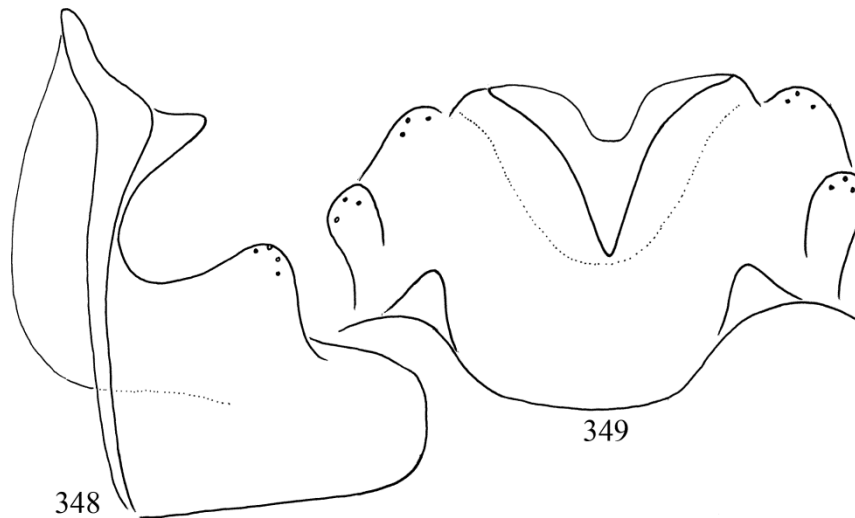
Most close to *K. bakurianica* sp. nov. but differs by having paraproct longer, with concave dorsum and more blunt upward turning; dorsal sclerite of aedeagus slightly tapering, not tripartite; lateral lobes of the dorsal sclerites more robust, mesal excision narrow, not wide; the lateral profile of the anal tube with more produced ventral half, but with rounded apical margin, not truncate; dorsal view of the apicodorsal excision on anal tube very deep V-shaped, not parallel-sided; apicoventral mesal excision pronounced deep subquadrangular, not small, just discernible.

*Description.* Male (in alcohol). Yellowish pale brownish medium-sized species with pale testaceous body appendages and with pale yellowish-testaceous wings. Forewing with rounded apex and with tendency to brachyptery; forewing equal or variously shorter or slightly longer than abdomen, very long erect spine-like setae present both on the membrane and on the veins; setae on the veins usually stronger. Tibial spur number 033 at male. Forewing length 6 mm. Female colour pattern is similar to the male. Length of forewing 9 mm. Tibial spur 133. Brachyptery tendency even more pronounced than at male. Forewing shorter than the enlarged abdomen, unable to fly.

*Male genitalia.* Protuberance of spinulose area of vestitural noncellular microtrichia very enlarged, highly inflated mesad, like a ball with lateroventral wings on tergite VIII, the lateroventral



**Figures 335–347.** *Kelgena imeretica* Oláh & Vinçon, sp. nov. Holotype: 335 = male genitalia in left lateral view, 336 = aedeagus in lateral view, 337 = aedeagus in ventral view, 338–347 = lateral profile of paraproct at paratypes.



**Figures 348–349.** *Kelgena imeretica* Oláh & Vinçon, sp. nov. Allotype: 348 = female genitalia in left lateral view, 349 = female genitalia in dorsal view.

wings are more densely covered with small and short but elongated spicule-like structures. Segment IX slightly longer ventrally; very short strap or bridle-like dorsally. Segment X partly fused to basal region of cerci forming together a short dorsal concavity. Cerci large subquadrangular. Paraproct forms a pair of heavily sclerotized elongated triangular plates with tapering and upward turning tip. Gonopods abbreviated subquadrangular in lateral view. Phallic organ composed of a

dorsal plate heavily sclerotized, deeply V-shaped excised apically and a pair of long apicomesally sclerotized processes with laterad directed pointed apices.

*Female genitalia.* There is a closed “anal tube” formed by the complex of the variously fused tergite IX and segment X. Tergite IX forms a basal concavity strapped to the partially setose sternite IX. Setose sternite IX connected by less glabrous mesal plate, this ventral surface, the

supragenital plate functions like the upper vaginal lip. Segment X forms a closed tube; its apical dorsum with a very deep sharply V-shaped mesal excision; its apical ventrum with a deep subquad-rangular mesal excision. The lower vaginal lip, the vulvar scale is membranous, badly visible. Vaginal sclerite complex visible subquadrangular in dorsal view.

*Etymology.* The name was given from the regional name of the type locality, Imereti Region, Georgia

***Kelgena kelensis* (Martynov, 1926)**

(Figures 350–366, Map 17)

*Chaetopterygella kelensis* Martynov, 1926:50-53: “The described species is very distinct, remote from the *Chaetopterygella abchazica* Mart., although resembling it, as also *Chaetopteryx* Mc L., by its habitus. In the structure of the genitalia it resembles also *Psilopteryx psorosa* Kol. and *Psilopterna pezvovi* Mart. *Ch. abchazica* somewhat resembles *Ps. zimmeri*.” Type series from Georgia, (Georgian Military Road), Gudaur (the nearest settlement to the lake of Kel), Lake Kel, 5-6.IX.1923, 2 males, 4 females.

*Chaetopteryx kelensis* (Martynov, 1926). Schmid 1959: 789 based on the examination of the type species of the *Chaetopterygella* genus, *Chaetopterygella abchazica* Martynov, 1916, collected in Iran, the *Chaetopterygella* genus has been synonymized with the *Chaetopteryx* genus.

*Kelgena kelensis* (Martynov, 1926). Mey 1979b:265-270: *Chaetopterygella* was synonymised with *Chaetopteryx* by Schmid (1959) and a new genus *Kelgena* was erected for *Chaetopteryx kelensis* (Martynov, 1926) with the genotype new species, *Kelgena minima* Mey, 1979b. However, the examination, redrawing and redescription of *kelensis* was based not on the type series, but on specimens collected in West Caucasus, Georgia, Abkhasia, Lake Riza far from the type locality of Lake Kel on the Georgian Military Road. Specimens from Lake Riza and Lake Kel represent two distinct species.

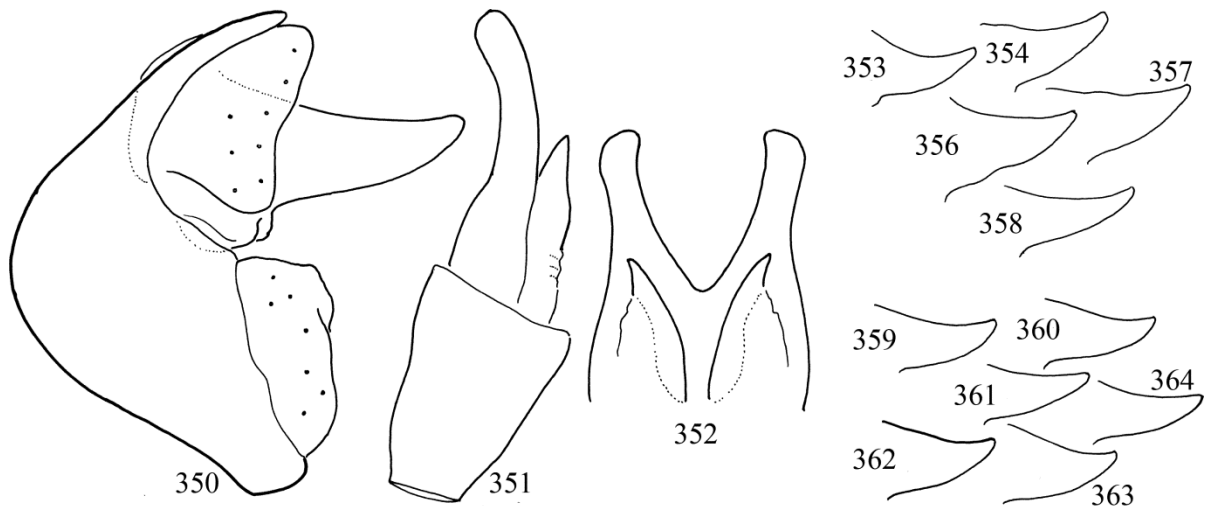
*Psilopterygopsis kelensis* (Martynov, 1926). Kumanski 1980:153-155: Martynov (1916) erected a new monobasic genus *Chaetopterygella* with the single species of *C. abchazica* and ten years later (Martynov 1926) described the second species, *Chaetopterygella kelensis*. Schmid (1959) syno-

nymised *Chaetopterygella* with *Chaetopteryx* based on *C. abchazica* collected in Iran. Examining the type series, collected at Lake Kel along the Georgian Military Road Kumansky (1980) has erected a new genus *Psilopterygopsis* for *Chaetopteryx kelensis* (Martynov, 1926).

*Material examined.* **Georgia**, Mtskheta-Mtianeti region, Kvemo Mleta, side spring and brook after the bridge above the village, tributary of Tetri Aragvi River, 42°25'55"N, 44°30'27"E, 1490m, 2.X.2019, leg. G. Vinçon (2 males, 2 females, OPC). Georgia, Mtskheta-Mtianeti region, Tibistskali Stream above its mouth to Terek River, 42°42'36N, 44°37'36"E, 1440m, 2.X.2019, leg. G. Vinçon (3 males, 2 females, OPC). Georgia, Mtskheta-Mtianeti region, spring and brook in grass land, W Gergeti Trinity Church, upwards the farm, 42°39'48"N, 44°36'07"E, 2200–2300m, leg. 2.X.2019, G. Vinçon (11 males, 9 females, OPC).

*Diagnosis.* This species distinguishable from all the other members of the genus by its character combination: (1) spinulose protuberance on tergite VIII is much enlarged, highly inflated mesad, like a ball with lateroventral wings. (2) Lateral profile of the paraproct long triangular without upward turning tip. (3) Lateral profile of the dorsal phallic sclerite almost parallel-sided. (4) Ventral profile of the dorsal phallic sclerite with wide V-shaped excision; its lateral lobes straight, with mesad turning head. (5) Pair of the endothecal sclerites large, similar to the length of the mesal excision on the dorsal phallic sclerite. (6) Lateral view of the apical margin of female anal tube with elongated ventral half. (7) Dorsal view of the apicodorsal excision V-shaped, not parallel-sided; apicoventral mesal excision pronounced, semicircular.

Most close to *K. bakurianica* sp. nov. Differs by having paraproct little longer and slender without upward turning tip; dorsal sclerite of aedeagus parallel-sided, not tripartite; the lateral profile of the anal tube with less produced ventral half; dorsal view of the apicodorsal excision on anal tube V-shaped, not very deep and narrow; apicoventral mesal excision pronounced semicircular, not small just visible.



**Figures 350–364.** *Kelgena kelensis* (Martynov, 1926). 350 = male genitalia in left lateral view, 351 = aedeagus in lateral view, 352 = aedeagus in ventral view, 353–364 = lateral profile of paraproct at paratypes.



**Figures 365–366.** *Kelgena kelensis* (Martynov, 1926). 365 = female genitalia in left lateral view, 366 = female genitalia in dorsal view.

*Redescription.* Male (in alcohol). Yellowish pale brownish medium-sized species with pale testaceous body appendages and with pale yellowish-testaceous wings. Forewing with rounded apex and with tendency to brachyptery; forewing equal or variously shorter or slightly longer than abdomen, very long erect spine-like setae present both on the membrane and on the veins; setae on the veins usually stronger. Tibial spur number 033 at male. Forewing length 7 mm. Female colour pattern is similar to the male. Length of forewing 9 mm. Tibial spur 133. Brachyptery tendency

even more pronounced than at male. Forewing shorter than the enlarged abdomen, unable to fly.

*Male genitalia.* Protuberance of spinulose area of vestitural noncellular microtrichia very enlarged, highly inflated mesad, like a ball with lateroventral wings on tergite VIII, the lateroventral wings are more densely covered with small and short but elongated spicule-like structures. Segment IX slightly longer ventrally; very short strap or bridle-like dorsally. Segment X partly fused to basal region of cerci forming together a short dorsal concavity. Cerci large slightly bi-

lobate. Paraproct forms a pair of heavily sclerotized elongated triangular slender plates without pronounced upward turning tip. Gonopods abbreviated subquadrangular in lateral view. Phallic organ composed of a dorsal plate heavily sclerotized, deeply V-shaped excised apically and a pair of shorter apicomesally sclerotized processes with laterad directed pointed apices.

*Female genitalia.* There is a closed “anal tube” formed by the complex of the variously fused tergite IX and segment X. Tergite IX forms a basal concavity strapped to the partially setose sternite IX. Setose sternite IX connected by less glabrous mesal plate, this ventral surface, the supragenital plate functions like the upper vaginal lip. Segment X forms a closed tube; its apical dorsum with a V-shaped mesal excision; its apical ventrum with a pronounced half circular mesal excision. The lower vaginal lip, the vulvar scale is membranous, badly visible. Vaginal sclerite complex visible subquadrangular in dorsal view.

***Kelgena macahelensis* Sipahiler, 1999**

(Map 17)

*Material examined.* **Georgia**, Adjara, Kintrishi Nature Reserve, above Khino, spring of Kintrishi River and brook, 41°45'31" N 42°06'50"E, 2300 m, 26.IX.2019, leg. G. Vinçon (2 males, OPC).

***Kelgena meyi* Oláh, sp. nov.**

(Map 17)

*Kelgena kelensis* (Martynov, 1926). Mey, 1979b: 267: **Georgia** Abkhasia, «1♂, 1♀, 19.X.1978, Riza-See (Westkaukasus), leg. Mey.» Misidentification!

*Material examined.* Holotype male: **Georgia**, Westcaucasus, Abchasia, Riza-Lake, 19.X.1978, leg. Mey (1 male, MNG).

*Diagnosis.* The new species represents the most western member of the genus and its paraproct is most diverged from all the other member of the genus. The paraproct is extremely slender, almost digitiform both in lateral and

ventral views. All the other species have more robust, elongated triangular paraproct.

*Description.* Brownish species with testaceous body appendages and with pale yellowish-testaceous wings. Forewing with rounded apex and with tendency to brachyptery; forewing equal to abdomen, very long erect spine-like setae present both on the membrane and on the veins. Tibial spur number 033 at male. Forewing length 7 mm. Length of forewing 9 mm. Tibial spur 133.

*Male genitalia.* Spinulose area of vestitural noncellular microtrichia very enlarged, the lateroventral wings are more densely covered with small and short but elongated spicule-like structures. Segment IX slightly longer ventrally; very short strap or bridle-like dorsally. Segment X partly fused to basal region of cerci forming together a short dorsal concavity. Cerci large subquadrangular in lateral view. Paraproct long extremely thin, slender. Gonopods abbreviated subquadrangular in lateral view. Phallic organ composed of a dorsal plate heavily sclerotized, V-shaped excised apically and a pair of shorter and slender sclerotized processes almost digitate both in lateral and ventral view.

*Remarks.* The examination, redrawing and re-description of *K. kelensis* (Martynov, 1926) by Mey (1979b) was based on specimens collected in West Caucasus, Georgia, Abkhasia, Lake Riza very far from the type locality of Lake Kel on the Georgian Military Road. Specimens from Lake Riza and Lake Kel represent two distinct species. Here we have redescribed and redrawn the genuine *K. kelensis* from the type locality of Lake Kel and compared it to the original description and drawings of specimen from Lake Riza. Based upon the very different male genital structures we have delineated the Lake Riza specimen as a new species, *Kelgena meyi* sp. nov.

***Kelgena minima* Mey, 1979**

(Map 17)

*Material examined.* **Russia**, West Caucasus, Teberda Nature Reserve, 1.X.1974, leg. Joost (1 male, 1 female, OPC).

***Kelgena parhuza* Oláh & Vinçon, sp. nov.**

(Figures 367–371, Map 17, Photos 4–5)

*Material examined.* Holotype: **Georgia**, Mingrelia and High Svanetia region, steep brook and spring, Nakra valley, Utviri tributary, 43°04'36" N, 42°20'11"E, 2300m, leg. 23.IX.2019, leg. G. Vinçon (1 male, OPC). Allotype: same as holotype (1 female, OPC). Paratypes: same as holotype (11 males, OPC). Georgia, Mingrelia and High Svanetia region, spring, Nakra valley, Utviri tributary, 43°04'48" N, 42°21'33"E, 1750m, 23.IX.2019. Georgia, Mingrelia and High Svanetia region, spring, Nakra valley, Utviri tributary, 43°04'47" N, 42°21'57"E, 1620m, 23.IX.2019. leg. G. Vinçon (1 male, OPC).

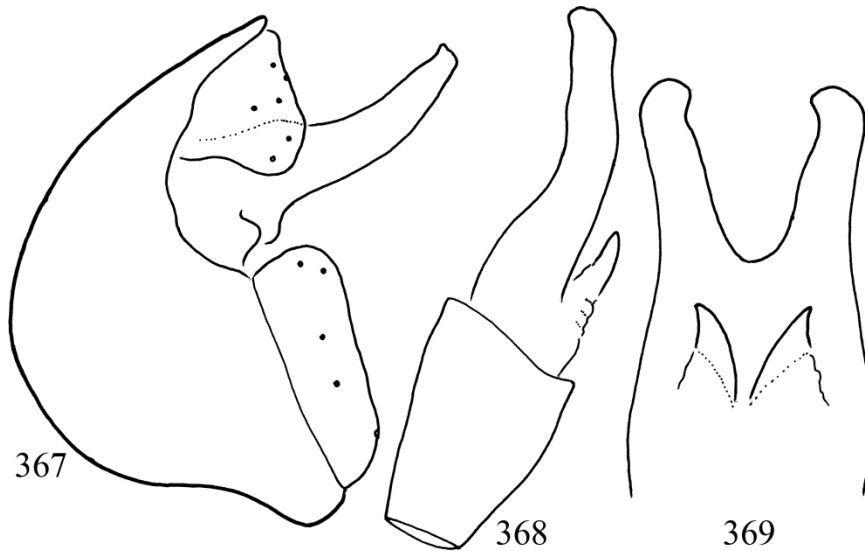
*Diagnosis.* This new species is distinguishable from all the other members of the genus by its character combination: (1) spinulose protuberance on tergite VIII is much enlarged, highly inflated mesad, like a ball with lateroventral wings. (2) Lateral profile of the paraproct long, very slender with upward curving and tapering apex. (3) Lateral profile of the dorsal phallic sclerite almost parallel-sided. (4) Ventral profile of the dorsal phallic sclerite with V-shaped excision; its lateral lobes stout, with pronounced mesad turning. (5) Pair of the endothecal sclerites small, only half the length of the mesal excision on the dorsal phallic sclerite. (6) Lateral view of the female anal tube without middle produced apical margin. (7) Dorsal view of the apicodorsal excision subquadrangular; apicoventral mesal excision smaller, semicircular.

Most close to *K. topora* sp. nov. described from the same region of Svanetia, Georgia. Differs by having paraproct more slender; dorsal sclerite of aedeagus parallel-sided, not tapering apicad; the lateral profile of the anal tube without more produced mesal lobe; dorsal view of the apicodorsal excision on anal tube subquadrangular, not deep and narrow; apicoventral mesal excision small semicircular, not deep and not very wide.

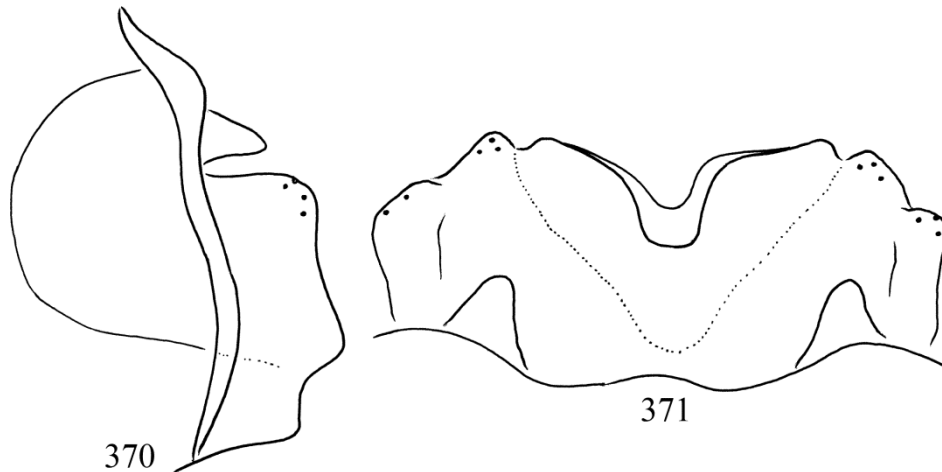
*Description.* Male (in alcohol). Yellowish pale brownish medium-sized species with pale testaceous body appendages and with pale yellowish-testaceous wings. Forewing with rounded apex and with tendency to brachyptery; forewing equal or variously shorter or slightly longer than abdomen, very long erect spine-like setae present both on the membrane and on the veins; setae on the veins usually stronger. Tibial spur number 033 at male. Forewing length 9 mm. Female colour pattern is similar to the male. Length of forewing 7 mm. Tibial spur 133. Brachyptery tendency even more pronounced than at male. Forewing shorter than the enlarged abdomen, unable to fly.

*Male genitalia.* Protuberance of spinulose area of vestitural noncellular microtrichia very enlarged, highly inflated mesad, like a ball with lateroventral wings on tergite VIII, the lateroventral wings are more densely covered with small and short but elongated spicule-like structures. Segment IX slightly longer ventrally; very short strap or bridle-like dorsally. Segment X partly fused to basal region of cerci forming together a short dorsal concavity. Cerci large subtriangular. Paraproct forms a pair of heavily sclerotized elongated and slender plates with tapering and upward arching apex. Gonopods abbreviated subquadrangular in lateral view. Phallic organ composed of a dorsal plate heavily sclerotized, deeply V-shaped excised apically and a pair of shorter apicomeres sclerotized processes with laterad directed pointed apices.

*Female genitalia.* There is a closed "anal tube" formed by the complex of the variously fused tergite IX and segment X. Tergite IX forms a basal concavity strapped to the partially setose sternite IX. Setose sternite IX connected by less glabrous mesal plate, this ventral surface, the supragenital plate functions like the upper vaginal lip. Segment X forms a closed tube; its apical dorsum excised mesally in a subquadrangular shape; its apical ventrum with a semicircular smaller mesal excision. The lower vaginal lip, the vulvar scale is membranous, badly visible. Vaginal sclerite complex visible subquadrangular in dorsal view.



**Figures 367–369.** *Kelgena parhuza* Oláh & Vinçon, sp. nov. Holotype: 367 = male genitalia in left lateral view  
368 = aedeagus in lateral view, 369 = aedeagus in ventral view.



**Figures 370–371.** *Kelgena parhuza* Oláh & Vinçon, sp. nov. Allotype: 370 = female genitalia in left lateral view  
371 = female genitalia in dorsal view.

*Etymology.* *parhuza*, coined from “párhuzam, párhuzamos” parallel-sided in Hungarian, refers to the lateral profile of the dorsal phallic sclerite with parallel-sided shape.

***Kelgena svanetica* Oláh & Vinçon, sp. nov.**

(Figures 372–377, Map 17, Photos 3–5)

*Material examined.* Holotype: **Georgia**, Mingrelia and High Svanetia region, brooklet and spring NW above the camping place, Nakra

valley, Utviri tributary, 43°04'49" N, 42°19'41"E, 2300-2500m, 23.IX.2019, leg. G. Vinçon (1 male, OPC). Allotype: same as holotype (1 female, OPC). Paratypes: same as holotype (15 males, 3 females, OPC; 6 males, 2 females, NMPC). Georgia, Mingrelia and High Svanetia region, spring, Nakra valley, Utviri tributary, 43°04'48" N, 42°21'33"E, 1750m, 23.IX.2019. Georgia, Mingrelia and High Svanetia region, spring, Nakra valley, Utviri tributary, 43°04'47" N, 42°21'57"E, 1620 m, 23.IX.2019, leg. G. Vinçon (1 male, OPC). Georgia, Mingrelia and High Svanetia region,



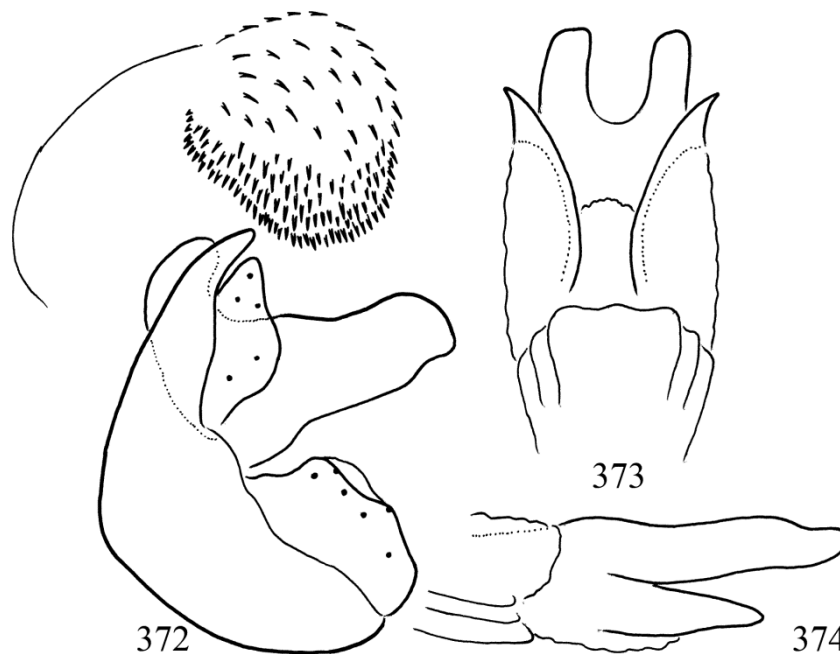
spring, Nakra valley, Utviri tributary, 43°04'41" N, 42°22'05"E, 1520m, 23.IX.2019 + Georgia, Mingrelia and High Svanetia region, spring, Nakra valley, Utviri tributary, 43°04'41" N, 42°22'13"E, 1510m, 23.IX.2019, leg. G. Vinçon (3 males, OPC). Georgia, Mingrelia and High Svanetia region, steep brook and spring, Nakra valley, Utviri tributary, 43°04'37" N, 42°20'25"E, 2200m, 23.IX.2019, leg. G. Vinçon (15 males, 6 females, OPC).

*Diagnosis.* This new species is easily distinguished from all the other members of the genus by its enlarged, very high and robust lateral profile of the paraproct slightly excised ventrally subapicad.

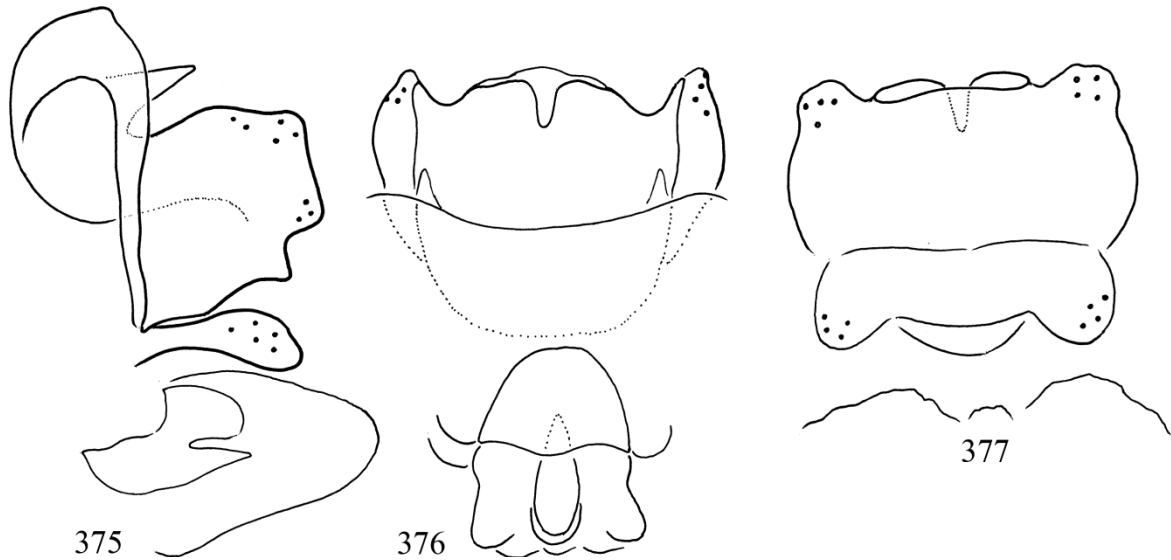
*Description.* Male (in alcohol). Yellowish pale brownish small species with pale testaceous body appendages and with pale yellowish-testaceous wings. Forewing with rounded apex and with tendency to brachyptery; forewing equal or variously shorter or slightly longer than abdomen, very long erect spine-like setae present both on the membrane and on the veins; setae on the veins

usually stronger. Tibial spur number 033. Forewing length 7 mm. Female colour pattern is similar to the male. Length of forewing 9 mm. Tibial spur 133. Brachyptery tendency even more pronounced than at male. Forewing shorter than the enlarged abdomen, unable to fly.

*Male genitalia.* Protuberance of spinulose area of vestitural noncellular microtrichia very enlarged, highly inflated mesad, like a ball with lateroventral wings on tergite VIII; the lateroventral wings are more densely covered with small and short but elongated spicule-like structures. Segment IX longer ventrally; very short strap or bridle-like dorsally. Segment X partly fused to basal region of cerci forming together a dorsal concavity. Cerci large and subquadrangular. Paraproct forms a pair of heavily sclerotized horizontal elongated plates with blunt apex and characterizes with small subapical ventral constriction. Gonopods abbreviated subquadrangular in lateral view. Phallic organ composed of a dorsal heavily sclerotized plate deeply U-shaped excised apically and a pair of shorter apically sclerotized processes with laterad directed pointed apices.



**Figures 372–374.** *Kelgena svanetica* Oláh & Vinçon, sp. nov. Holotype: 372 = male genitalia in left lateral view 373 = aedeagus in lateral view, 374 = aedeagus in ventral view.



**Figures 375–377.** *Kelgena svanetica* Oláh & Vinçon, sp. nov. Allotype: 375 = female genitalia in left lateral view, 376 = female genitalia in dorsal view with the vaginal sclerite complex, 377 = female genitalia in ventral view.

*Female genitalia.* There is a closed “anal tube” formed by the complex of the variously fused tergite IX and segment X. Tergite IX forms a basal concavity strapped to the partially setose sternite IX. Setose sternite IX connected by less glabrous mesal plate, this ventral surface, the supragenital plate functions like the upper vaginal lip. Segment X forms a close anal tube its dorsal apical margin very deeply and narrowly excised. The lower vaginal lip, the vulvar scale is membranous, badly visible. Vaginal sclerite complex visible subquadrangular in dorsal view.

*Etymology.* Name was given from the region name of the type locality, Svanetia.

***Kelgena tolaka* Oláh & Kovács, sp. nov.**

(Figures 378–394, Map 17, Photos 32–33)

*Material examined.* Holotype: **Georgia**, Adjara, Mtsvane Tba (Green Lake), N of Goderdzi Pass, N41°40.469' E42°29.892', 2075m, 27.IX. 2019, leg. T. Kovács & D. Murányi (1 male, OPC). Allotype: same as holotype (1 female, OPC). Paratypes: same as holotype (15 males, OPC; 2 males, NMPC).

*Diagnosis.* This new species is distinguishable from all the other members of the genus by its character combination: (1) spinulose protuberance

on tergite VIII is much enlarged, highly inflated mesad, like a ball with lateroventral wings. (2) Lateral profile of the paraproct abbreviated, high basad with tapering apex. (3) Lateral profile of the dorsal phallic sclerite slightly arching upward, almost parallel-sided, less tapering. (4) Ventral profile of the dorsal phallic sclerite with V-shaped excision; its lateral lobes stout, with pronounced mesad turning. (5) Pair of the endothecal sclerites small, only half the length of the mesal excision on the dorsal phallic sclerite. (6) Lateral view of the female anal tube with ventrad produced apical margin. (7) Dorsal view of the apicodorsal excision on anal tube almost parallel-sided deeply and narrowly excised; apicoventral mesal excision lacking.

Most close to *K. adjarica* sp. nov. described from several regions of Adjara, Georgia. Differs by having paraproct shorter, abbreviated and with tapering apex, not blunt; dorsal sclerite of aedeagus less arching, not tapering almost parallel-sided; the lateral profile of the anal tube with ventrad produced apical margin, not simply trilobed; the apical ventrum of the female anal tube without any excision.

*Description.* Male (in alcohol). Yellowish pale brownish small species with pale testaceous body appendages and with pale yellowish-testaceous

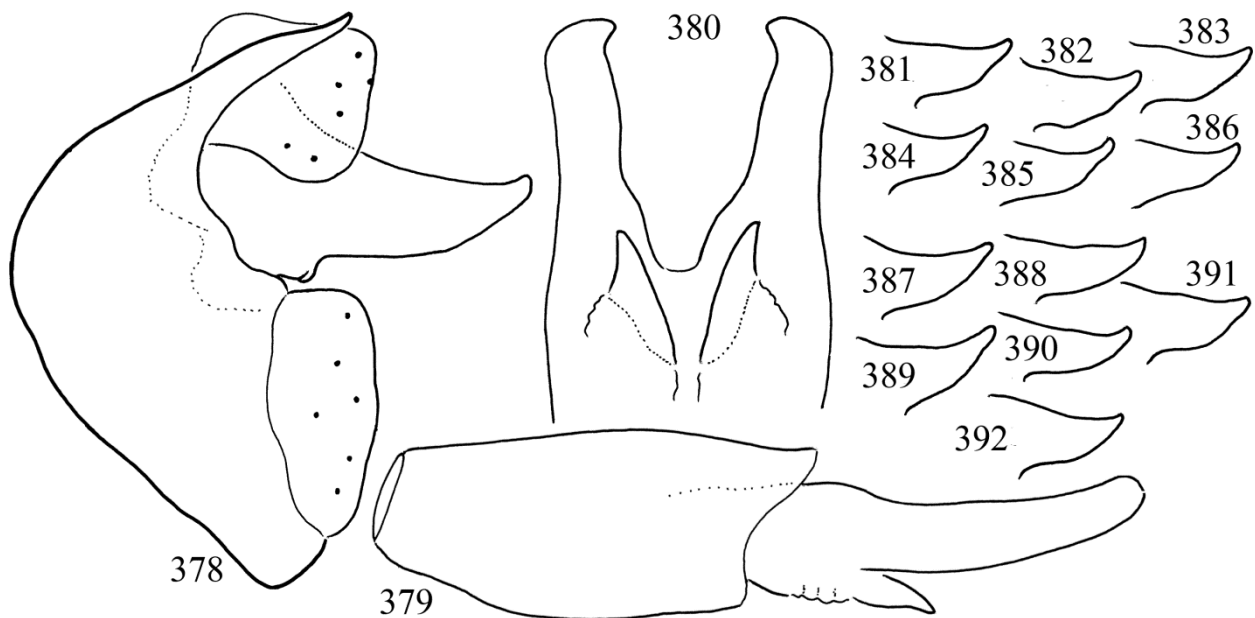
wings. Forewing with rounded apex and with tendency to brachyptery; forewing equal or variously shorter or slightly longer than abdomen, very long erect spine-like setae present both on the membrane and on the veins; setae on the veins usually stronger. Tibial spur number 033 at male. Forewing length 6 mm. Female colour pattern is similar to the male. Length of forewing 8 mm. Tibial spur 133. Brachyptery tendency even more pronounced than at male. Forewing shorter than the enlarged abdomen, unable to fly.

*Male genitalia.* Protuberance of spinulose area of vestitural noncellular microtrichia very enlarged, highly inflated mesad, like a ball with lateroventral wings on tergite VIII, the lateroventral wings are more densely covered with small and short but elongated spicule-like structures. Segment IX longer ventrally; very short strap or bridle-like dorsally. Segment X partly fused to basal region of cerci forming together a short dorsal concavity. Cerci large and subtriangular. Paraproct forms a pair of heavily sclerotized horizontal elongated plates with upward arching and tapering apex. Gonopods abbreviated subquadrangular in lateral view. Phallic organ composed of a dorsal plate heavily sclerotized,

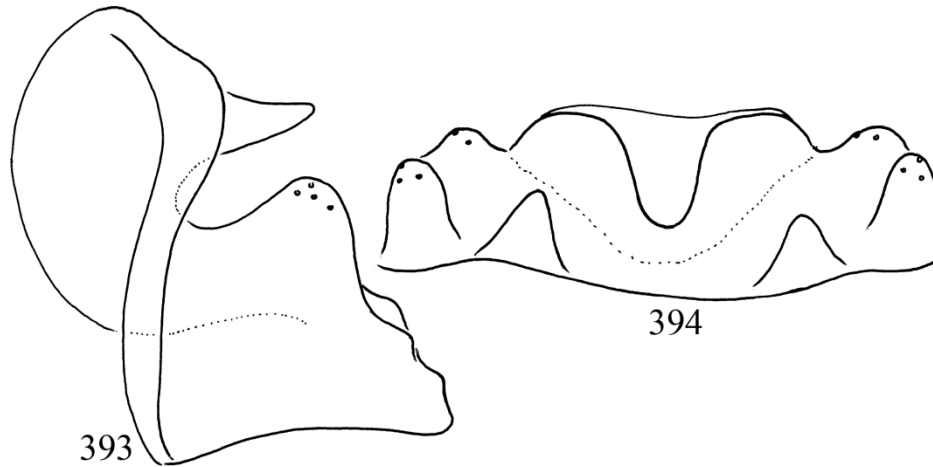
deeply V-shaped excised apically and a pair of shorter apicomesally sclerotized process with laterad directed pointed apices.

*Female genitalia.* There is a closed “anal tube” formed by the complex of the variously fused tergite IX and segment X. Tergite IX forms a basal concavity strapped to the partially setose sternite IX. Setose sternite IX connected by less glabrous mesal plate, this ventral surface, the supragenital plate functions like the upper vaginal lip. Segment X forms a closed tube; its apical dorsum very deeply and narrowly excised; its apical ventrum without any mesal excision. The lower vaginal lip, the vulvar scale is membranous, badly visible. Vaginal sclerite complex visible subquadrangular in dorsal view.

*Etymology.* *tolaka*, coined from “tólakó” living in a lake in Hungarian, refers to the Green Lake habitat where the holotype, allotype and all the paratypes have been collected. Remarkable how this species diverged in this lake habitat surrounded by the stream dwelling *K. adjarica* sp. nov. Just along the down flow of the lake *K. adjarica* was collected, not *K. tolaka*.



Figures 378–392. *Kelgena tolaka* Oláh & Kovács, sp. nov. Holotype: 378 = male genitalia in left lateral view, 379 = aedeagus in lateral view, 380 = aedeagus in ventral view, 381–392 = lateral profile of paraproct at paratypes.



Figures 393–394. *Kelgena tolaka* Oláh & Kovács, sp. nov. Allotype: 393 = female genitalia in left lateral view  
394 = female genitalia in dorsal view.

***Kelgena topora* Oláh & Vinçon, sp. nov.**

(Figures 395–399, Map 17, Photos 3–5)

*Material examined.* Holotype: **Georgia**, Mingrelia and High Svanetia region, brooklet and spring NW above the camping place, Nakra valley, Utviri tributary, 43°04'49" N, 42°19'41"E, 2300–2500m, 23.IX.2019, leg. G. Vinçon (1 male, OPC). Allotype: Georgia, Mingrelia and High Svanetia region, steep brook and spring, Nakra valley, Utviri tributary, 43°04'36" N, 42°20'11"E, 2300m, 23.IX.2019. leg. G. Vinçon (1 female, OPC). Paratypes: same as holotype (8 males, OPC).

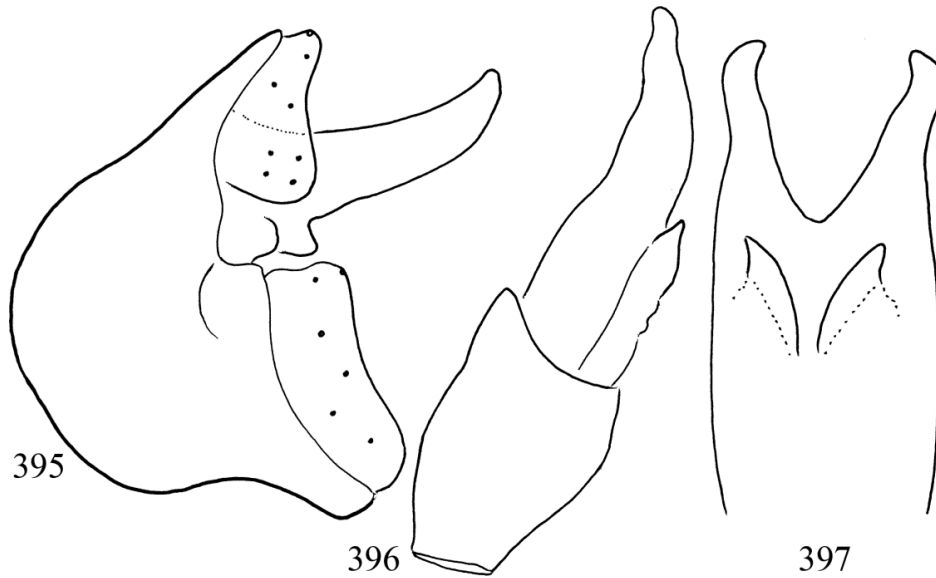
*Diagnosis.* This new species is distinguishable from all the other members of the genus by its character combination: (1) spinulose protuberance on tergite VIII is much enlarged, highly inflated mesad, like a ball with lateroventral wings. (2) Lateral profile of the paraproct long, slender with upward curving and tapering apex. (3) Lateral profile of the dorsal phallic sclerite slightly gradually tapering. (4) Ventral profile of the dorsal phallic sclerite with V-shaped excision; its lateral lobes slender, with pronounced mesad turning. (5) Pair of the endothelial sclerites small, only half the length of the mesal excision on the dorsal phallic sclerite. (6) Lateral view of the female anal tube with middle produced apical

margin. (7) Dorsal view of the apicodorsal excision on anal tube deep and narrow; apicoventral mesal excision deep and very wide.

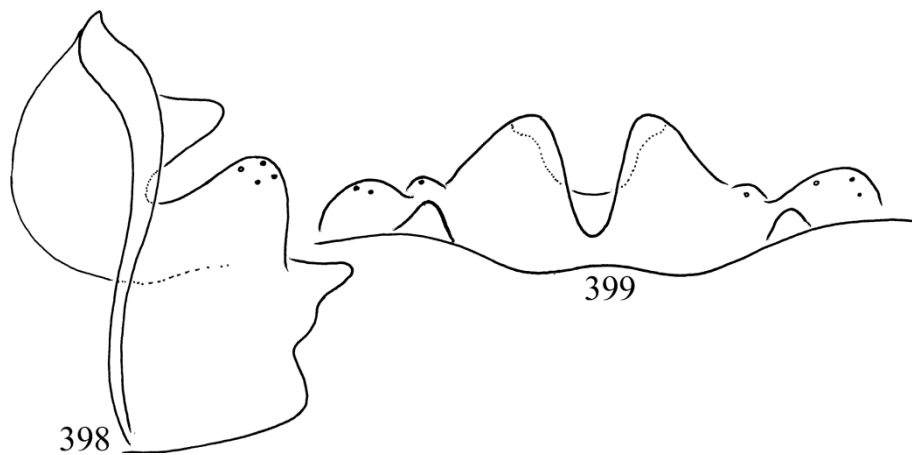
Most close to *K. parhuza* sp. nov. described from the same region of Svanetia, Georgia. Differs by having paraproct not so slender; dorsal sclerite of aedeagus tapering apicad, not parallel-sided; the lateral profile of the anal tube with more produce mesal lobe; dorsal view of the apicodorsal excision on anal tube deep and narrow; apicoventral mesal excision deep and very wide.

*Description.* Male (in alcohol). Yellowish pale brownish medium-sized species with pale testaceous body appendages and with pale yellowish-testaceous wings. Forewing with rounded apex and with tendency to brachyptery; forewing equal or variously shorter or slightly longer than abdomen, very long erect spine-like setae present both on the membrane and on the veins; setae on the veins usually stronger. Tibial spur number 033 at male. Forewing length 10 mm. Female colour pattern is similar to the male. Length of forewing 9 mm. Tibial spur 133. Brachyptery tendency even more pronounced than at male. Forewing shorter than the enlarged abdomen, unable to fly.

*Male genitalia.* Protuberance of spinulose area of vestitural noncellular microtrichia very enlarged, highly inflated mesad, like a ball with



Figures 395–397. *Kelgena topora* Oláh & Vinçon, sp. nov. Holotype: 395 = male genitalia in left lateral view, 396 = aedeagus in lateral view, 397 = aedeagus in ventral view.



Figures 398–399. *Kelgena topora* Oláh & Vinçon, sp. nov. Allotype: 398 = female genitalia in left lateral view, 399 = female genitalia in dorsal view.

lateroventral wings on tergite VIII, the lateroventral wings are more densely covered with small and short but elongated spicule-like structures. Segment IX slightly longer ventrally; very short strap or bridle-like dorsally. Segment X partly fused to basal region of cerci forming together a short dorsal concavity. Cerci large short and high. Paraproct forms a pair of heavily sclerotized elongated and slender plates with tapering and upward arching apex. Gonopods abbreviated subquadrangular in lateral view. Phallic organ

composed of a dorsal plate heavily sclerotized, deeply V-shaped excised apically and a pair of shorter apicomeres sclerotized processes with laterad directed pointed apices.

*Female genitalia.* There is a closed “anal tube” formed by the complex of the variously fused tergite IX and segment X. Tergite IX forms a basal concavity strapped to the partially setose sternite IX. Setose sternite IX connected by less glabrous mesal plate, this ventral surface, the supragenital plate functions like the upper vaginal

lip. Segment X forms a closed tube; its apical dorsum very deeply and narrowly excised; its apical ventrum with a deep and wide mesal excision. The lower vaginal lip, the vulvar scale is membranous, badly visible. Vaginal sclerite complex visible subquadrangular in dorsal view.

*Etymology.* *topora*, coined from “töpörödött, töpör” shriveled in Hungarian, refers to lateral profile of the dorsal phallic sclerite with slender, tapering apices.

### ***Kelgena* sp.**

*Material examined.* **Azerbaijan**, Gədəbəy district, Gədəbəy, bushy brook and seep S of the village, N40°27.519' E45°43.114', 1500m, 1.X. 2019 leg. T. Kovács, P. Manko, D. Murányi (2 females, OPC).

### ***Rizeiella* Sipahiler, 1986a**

*Rizeiella*, as a monobasic genus is described from Rize (Turkey) with type species of *R. anatolica* Sipahiler, 1986a. It was distinguished from *Chaetopteryx* and *Kelgena* genera originally by its strong pubescence on the membrane of the forewing as well as by the presence of vestigial paramere with apical setae. Later the discovery of the second species, *R. camiliensis*, only 120 km away from the habitat of the type species, with even more reduced parameres, inspired Sipahiler (1999) to consider a tendency for parameres reduction in the genus *Rizeiella*.

Here we describe four new species from Georgia with almost complete parameres and with forewings without any real pubescence detectable on the forewing membrane undermining the reality of the genus ranking values of these characters. Moreover, the discovery of the fifth new, most divergent species, *Rizeiella tavola* sp. nov. collected on the periphery of the known distributional area of the genus and having completely lost the paramere also questions the genus ranking value of the presence of reduced paramere. A study on paramere organisation in the Limnephilinae subfamily has revealed paramere reduction leading to complete paramere lost in several

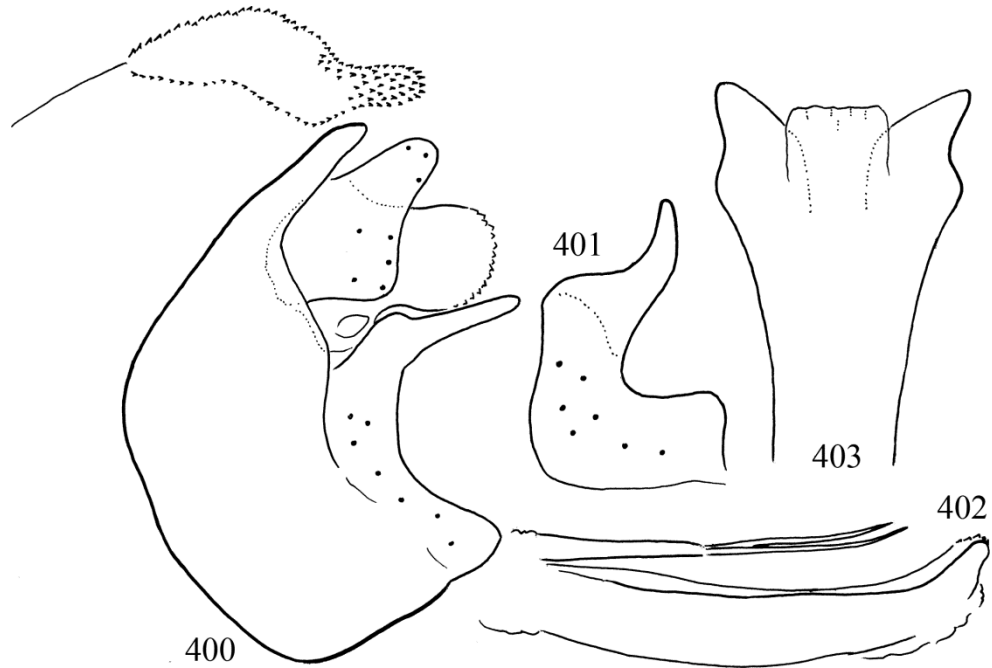
taxa in various lineages. This is an especially typical and very common organisational pattern in the Chaetopterygini tribe, most genera have lineages with and without complete paramere. In this tribe the stimulatory function of the paramere is taken over by heavy enforcement of different structures on the aedeagus or even on periphallallic organs (Oláh et al. 2019b).

The generic ranking reality of the *Rizeiella* genus is supported by the particularly organised phallic complex, a complex participating directly both in ancestral and contemporary initial splits of taxa in allopatric isolation by sexual integration under an adaptive, more stabilized integrative complex of molecular mechanisms. The sclerotically enforced aedeagus has typically a fused single sclerotic structure in the genera *Annitella*, *Badukiella* and *Chaetopterygopsis*, a pair of sclerotic structures in the *Rizeiella* genus and two pairs of sclerotic structures in the *Kelgena* genus. The qualifier word “typically” is however important to understand precisely. It refers to consequences of the incongruent epistemology in taxonomy caused by chimeric ontology and producing frequent deviations in most lineages. Therefore, our taxonomy is based primarily on character combinations (Oláh et al. 2019a). Taking into account of chimeric ontology the species delineation in the genus *Rizeiella* is realised by following character combination: (1) paraproct width and height; (2) caudal profile of the gonopods; (3) lateral profile of gonopods (4) arching, length and width of paramere shaft; (5) the number and shape of apical setae of the parameres; (6) the shape of lateral apices of the sclerotized processes of the aedeagus; (7) the extension of the paramere trough, the dorsal excavation of the elongated concavity on the sclerotized dorsal processes of the aedeagus.

### ***Rizeiella bayae* Vinçon & Oláh, sp. nov.**

(Figures 400–403, Map 18, Photos 23–24)

*Material examined.* Holotype: **Georgia**, Adjara region, Kintrishi National Reserve, above Khino, spring of Kintrishi River and brook, 41° 45'31" N, 42°06'50"E, 2300m, 26.IX.2019, leg.



Figures 400–403. *Rizeiella bayae* Oláh & Vinçon, sp. nov. Holotype: 400 = male genitalia in left lateral view, 401 = gonopod in ventral view, 402 = aedeagus in lateral view, 403 = head of aedeagus in ventral view.



Map 17. Distribution of *Kelgena* species (full circles represent the type localities)

G. Vinçon (1 male, OPC). Paratypes: Georgia, Gouria region, spring and brooks with snow, tributary of Bzhuzhi River, below Gomismta, , 41°49'57" N, 42°09'21"E, 1910–1980m, 24.IX. 2019, leg. G. Vinçon (3 males, 4 females, OPC).

*Diagnosis.* This new species is most close to *R. oldala* but distinguished by the following character combination: by the longer paramere shaft; by the paramere setal pattern having only two slender apical setae on the parameres; by the lateral apices of the sclerotized processes of the aedeagus characterized with triangular hump on the subapical region.

*Description.* Male (in alcohol). Yellowish pale brownish large-sized species with pale testaceous body appendages and with yellowish-testaceous wings. Forewing with less rounded apices, very long erect spine-like setae present on the membrane and on the veins; there is few pubescence present on the forewing membrane between costal and subcostal veins. Tibial spur number is 033. Forewing length is 12 mm.

*Male genitalia.* Protuberance of spinulose area of vestitural noncellular microtrichia on tergite VIII present, not subdivided by median bare line, with step-wise lateral profile due to the elongated finger-like apical portion. Segment IX longer ventrally; very short strap or bridle-like dorsally. Segment X partly fused to basal region of cerci forming together a very short dorsal concavity. Cerci slightly sclerotized, upward produced in lateral view and almost circular in caudal view. Paraproct elongated subquadrangular in lateral view with pegged rounded apical region, partially fused to cerci but the ventral branch of the paraproct produced downward. Gonopods with a single elongated mesal apical arm. Phallic organ is of typical *Rizeiella* type with a single strongly sclerotized dorsal pair of aedeagal processes with triangular apex and triangular hump subapical in ventral view. The paramere is completely produced, only little shorter than the aedeagus armed with 2 strong, bellied and long apical setae accompanied by six additional regular setae.

*Etymology.* This new species is named in honour of the collector's partner in life, to Dr Baya

Fadel, who has inspired his research on aquatic insects as well as supported his devoted collecting practices along the springs and streams in the sky islands of remote elevations in high mountain ranges.

***Rizeiella ereda* Oláh & Vinçon, sp. nov.**

(Figures 404–407, Map 18, Photos 18–19)

*Material examined.* Holotype: **Georgia**, Gouria region, big brook and spring, tributary of Bzhuzhi River, 41°50'49"N, 42°07'31"E, 920m, 24.IX.2019, leg. G. Vinçon (1 male, OPC).

*Diagnosis.* This new species is most close to *R. odva* but distinguished by the following character combination: by the shorter and higher paraproct; by the different caudal profile of the gonopods; by the less developed mesal arm on the head of the gonopods visible in lateral view; by the straight and longer paramere shaft; by the 6, that is the half number of the strong apical setae of the parameres; by the almost pointed lateral apices of the sclerotized processes of the aedeagus.

*Description.* Male (in alcohol). Yellowish pale brownish large-sized species with pale testaceous body appendages and with yellowish-testaceous wings. Forewing with less rounded apices, very long erect spine-like setae present on the membrane and on the veins; there is no pubescence present on the forewing membrane, not discernible even between costal and subcostal veins. Tibial spur number is 033. Forewing length is 14 mm.

*Male genitalia.* Protuberance of spinulose area of vestitural noncellular microtrichia on tergite VIII present, not subdivided by median bare line. Segment IX longer ventrally; very short strap or bridle-like dorsally. Segment X partly fused to basal region of cerci forming together a short dorsal concavity. Cerci slightly sclerotized, subquadrangular in lateral view and almost circular in caudal view. Paraproct quadrangular in lateral view and partially fused to cerci but the ventral branch of the paraproct produced downward. Gonopods with bilobed apex. Phallic organ is of



typically *Rizeiella* type with a single strongly sclerotized dorsal pair of aedeagal processes with laterad pointed apex. The paramere is completely produced, as long as the aedeagus, armed with 5 strong and long apical setae.

*Etymology.* *ereda*, coined from “eredeti” original, ancestral in Hungarian, refers to the almost fully retained paramere, a species with genuine paramere in a genus characterized by paramere reduction.

***Rizeiella odva* Oláh & Vinçon, sp. nov.**

(Figures 408–411, Map 18, Photo 27)

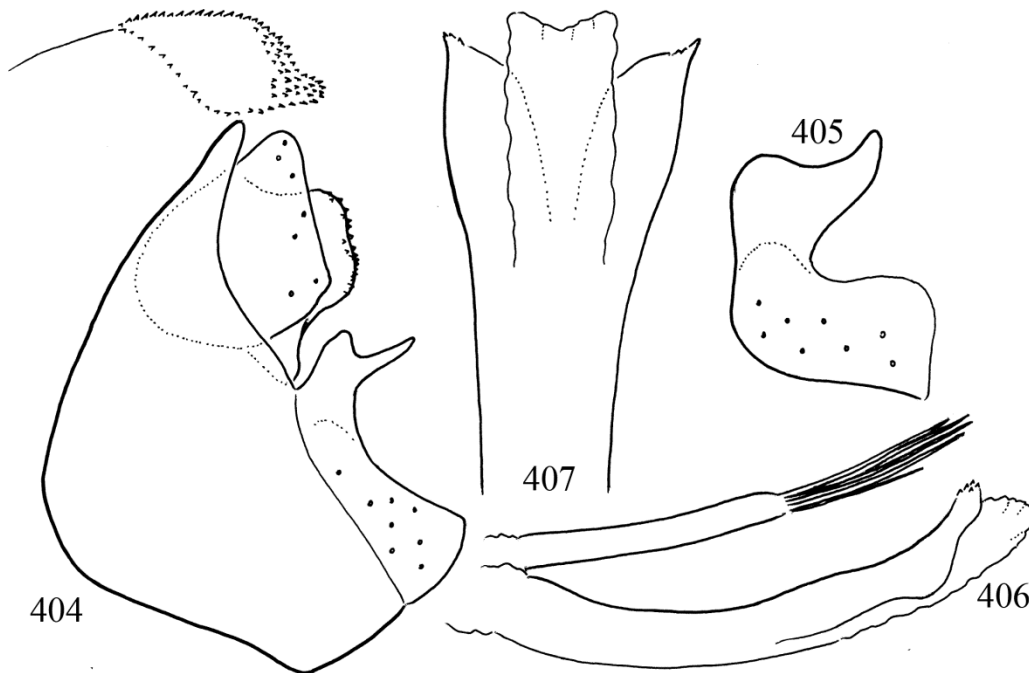
*Material examined.* Holotype: **Georgia**, Adjara region, Mtirala National Parc, above Chakvis-tavi, tributary of Sachokhia River, 41°39'28" N, 41°52'30"E, 1000m, 25.IX.2019, leg. G. Vinçon (1 male, OPC).

*Diagnosis.* This new species is most close to *R. ereda* but distinguished by the following character combination: by the longer and lower para-

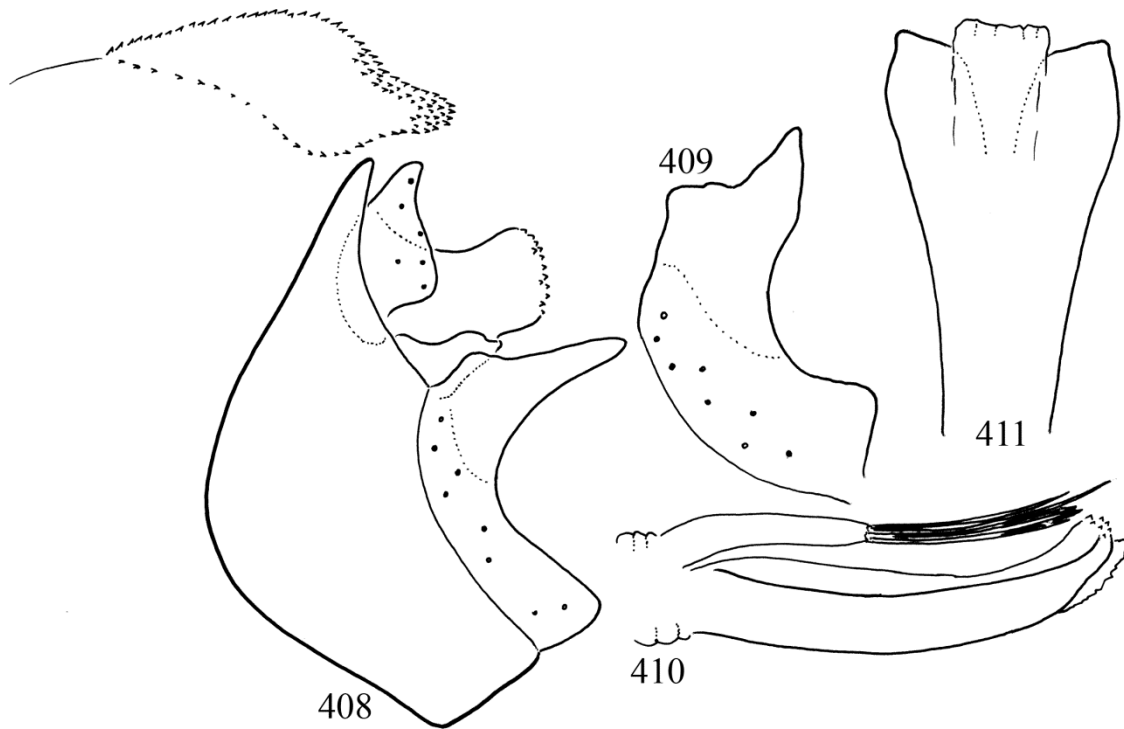
proct; by the different caudal profile of the gonopods; by the extremely elongated mesal arm on the head of the gonopods visible in lateral view; by the arching and stout paramere shaft; by the 12, that is the double number of the strong apical setae of the parameres; by the almost truncate lateral apices of the sclerotized processes of the aedeagus and by the deepest paramere trough.

*Description.* Male (in alcohol). Yellowish pale brownish large-sized species with pale testaceous body appendages and with yellowish-testaceous wings. Forewing with less rounded apices, very long erect spine-like setae present on the membrane and on the veins; there is few pubescence present on the forewing membrane between costal and subcostal veins. Tibial spur number is 033. Forewing length is 17 mm.

*Male genitalia.* Protuberance of spinulose area of vestitural noncellular microtrichia on tergite VIII present, not subdivided by median bare line, with step-wise lateral profile due to the elongated finger-like apical portion. Segment IX longer ventrally; very short strap or bridle-like dorsally. Seg-



**Figures 404–407.** *Rizeiella ereda* Oláh & Vinçon, sp. nov. Holotype: 404 = male genitalia in left lateral view, 405 = gonopod in ventral view, 406 = aedeagus in lateral view, 407 = head of aedeagus in ventral view.



**Figures 408–411.** *Rizeiella odva* Oláh & Vinçon, sp. nov. Holotype: 408 = male genitalia in left lateral view, 409 = gonopod in ventral view, 410 = aedeagus in lateral view, 411 = head of aedeagus in ventral view.

ment X partly fused to basal region of cerci forming together a very short dorsal concavity. Cerci slightly sclerotized, upward produced in lateral view and almost circular in caudal view. Paraproct quadrangular in lateral view and partially fused to cerci but the ventral branch of the paraproct produced downward. Gonopods with a single elongated mesal apical arm. Phallic organ is of typical *Rizeiella* type with a single strongly sclerotized dorsal pair of aedeagal processes with truncate apex. The paramere is completely produced, as long as the aedeagus and armed with 12 strong and long apical setae; the paramere trough, a pair of elongated concavities on the dorsum of aedeagal sclerites, housing the paramere, especially the setal region together, is long and deep.

*Etymology.* *odva*, coined from “odú, odúja, odva” has a hide of concavity in Hungarian, refers to the pair of deep, long trough of concavities on the dorsum of the sclerotized aedeagal processes.

***Rizeiella oldala* Oláh & Kovács, sp. nov.**

(Figures 412–415, Map 18, Photo 26)

*Material examined.* Holotype: **Georgia**, Adjara, Khabelashvilebi, Bird Spring, above (N of) the village, N41°45.063' E42°11.313', 2010m, 28.IX. 2019, leg. T. Kovács, & D. Murányi (1 male, OPC).

*Diagnosis.* This new species is most close to *R. hupla* but distinguished by the following character combination: by the shorter paramere shaft; by the paramere setal pattern having a pair of enlarged modified apical setae accompanied by six regular apical setae on the parameres; by the lateral apices of the sclerotized processes of the aedeagus characterized with produced rounded subapical region.

*Description.* Male (in alcohol). Yellowish pale brownish large-sized species with pale testaceous

body appendages and with yellowish-testaceous wings. Forewing with less rounded apices, very long erect spine-like setae present on the membrane and on the veins; there is few pubescence present on the forewing membrane between costal and subcostal veins. Tibial spur number is 033. Forewing length is 16 mm.

**Male genitalia.** Protuberance of spinulose area of vestitural noncellular microtrichia on tergite VIII present, not subdivided by median bare line, with step-wise lateral profile due to the elongated finger-like apical portion. Segment IX longer ventrally; very short strap or bridle-like dorsally. Segment X partly fused to basal region of cerci forming together a very short dorsal concavity. Cerci slightly sclerotized, upward produced in lateral view and almost circular in caudal view. Paraproct elongated subquadrangular in lateral view with pegged rounded apical region, partially fused to cerci but the ventral branch of the paraproct produced downward. Gonopods with a single elongated mesal apical arm. Phallic organ is of typical *Rizeiella* type with a single strongly sclerotized dorsal pair of aedeagal processes with truncate apex and rounded subapical region in

ventral view. The paramere is completely produced, only little shorter than the aedeagus armed with 2 strong, bellied and long apical setae accompanied by six additional regular setae.

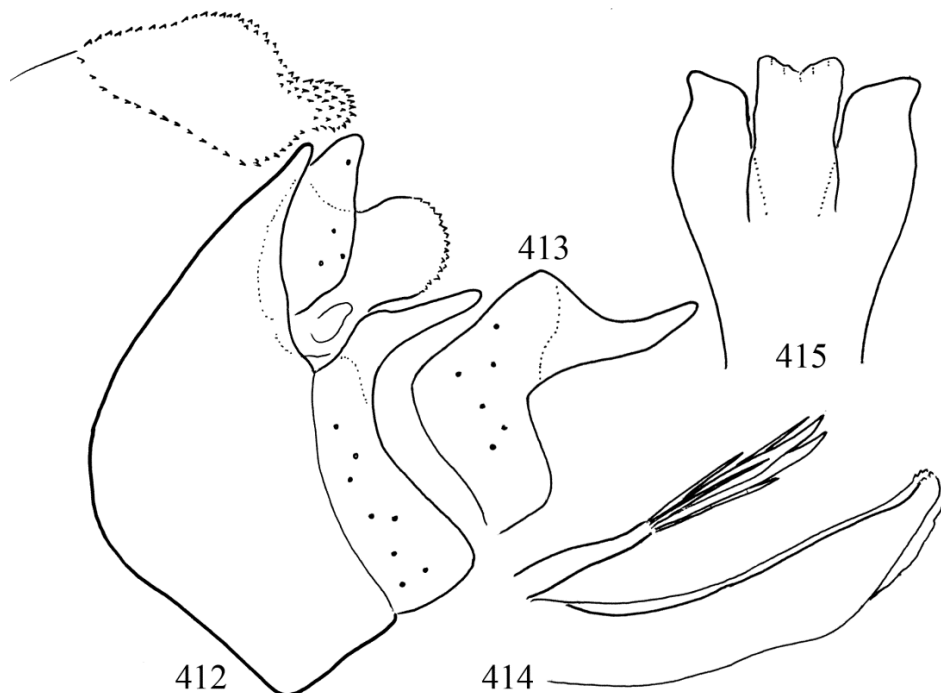
**Etymology.** *oldala*, coined from “oldal” side in Hungarian, refers to the laterally produced rounded subapical side of the sclerotized aedeagal processes.

***Rizeiella tavola* Oláh & Vinçon sp. nov.**

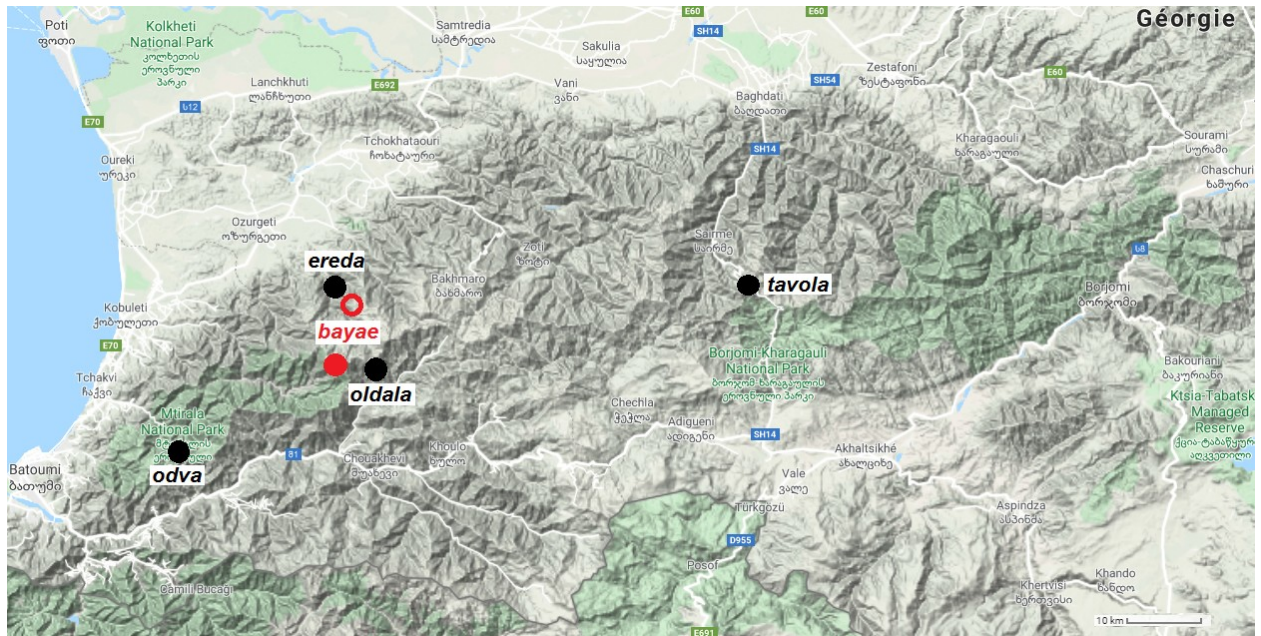
(Figures 416–423, Map 18, Photos 34–35)

**Material examined.** Holotype: **Georgia**, Imereti region, steep brook and spring, north slope of Zekari pass, below Didmaghala Pic, Tsablarastskali tributary, 41°50'55"N, 42°47'43"E, 2080 m, 28.IX.2019, leg. Vinçon (1 male, OPC). Allotype: same as holotype (1 female, OPC).

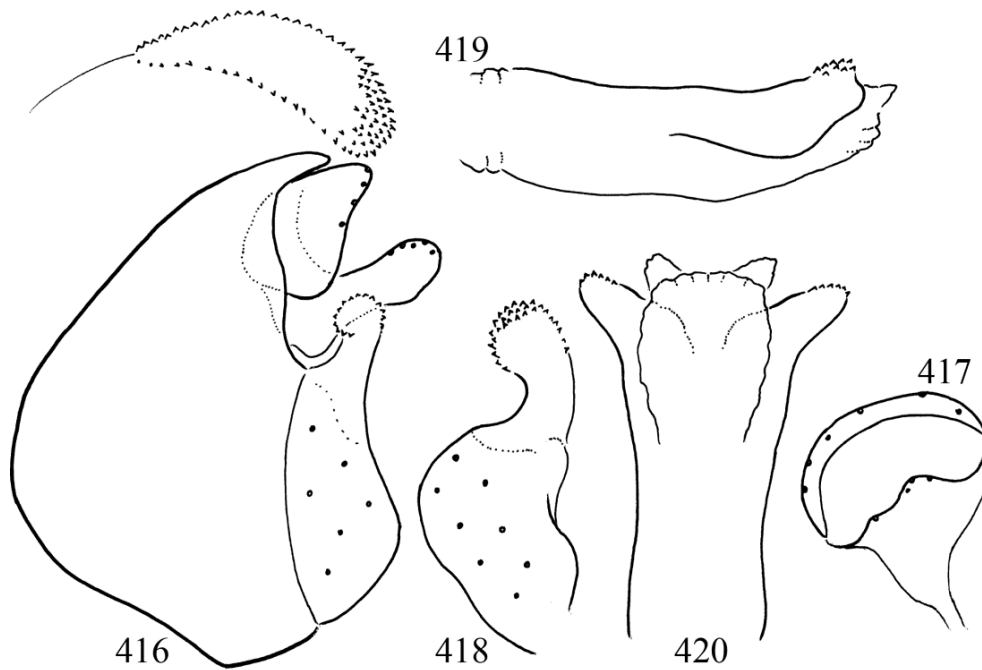
**Diagnosis.** This new species easily distinguished from all the other members of the genus by its gonopods with capitate and pegged head, by the fused cup-like cercal-paraproctal complex and by the shape of the aedeagal sclerites.



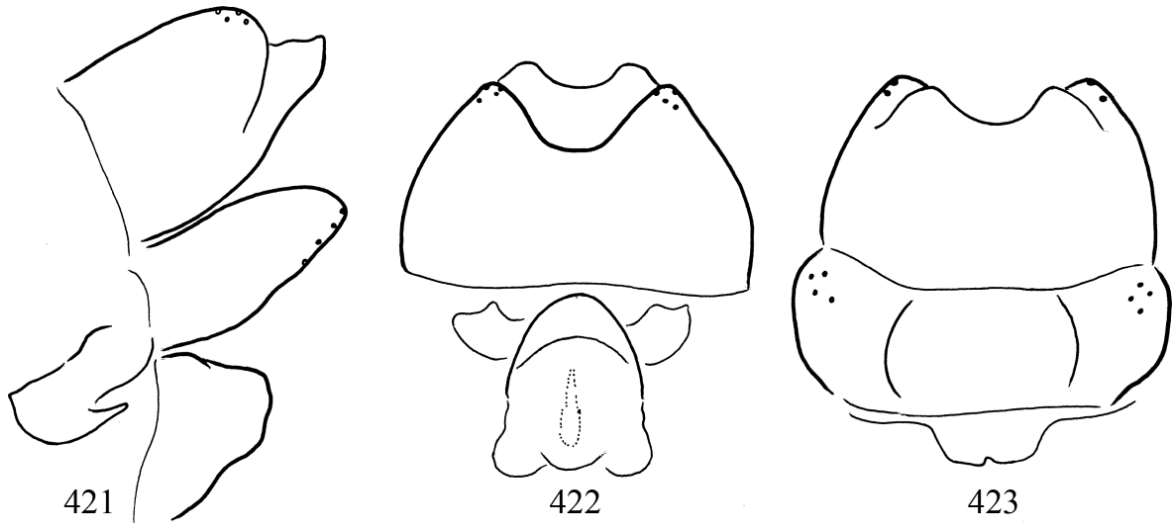
**Figures 412–415.** *Rizeiella oldala* Oláh & Kovács, sp. nov. Holotype: 412 = male genitalia in left lateral view, 413 = gonopod in ventral view, 414 = aedeagus in lateral view, 415 = head of aedeagus in ventral view.



Map 18. Distribution of *Rizeiella* species (full circles represent the type localities)



**Figures 416–420.** *Rizeiella tavola* Oláh & Vinçon, sp. nov. Holotype: 416 = male genitalia in left lateral view, 417 = left cercus in caudal view, 418 = gonopod in ventral view, 419 = aedeagus in lateral view, 420 = head of aedeagus in ventral view.



Figures 421–423. *Rizeiella tavola* Oláh & Vinçon, sp. nov. Allotype: 421 = female genitalia in left lateral view, 422 = female genitalia with the vaginal sclerite complex in dorsal view, 423 = female genitalia in ventral view.

*Description.* Male and female (in alcohol). Yellowish pale brownish medium-sized species with pale testaceous body appendages and with yellowish-testaceous wings. Forewing with less rounded apices, very long erect spine-like setae present on the membrane and on the veins; around every second setae on the veins stronger; there is some few pubescence present between costal and subcostal veins. Tibial spur number is 033 at male and 133 at female. Forewing length is 10 mm both at male and female.

*Male genitalia.* Protuberance of spinulose area of vestitural noncellular microtrichia on tergite VIII enlarged and subdivided by a narrow median bare line. Segment IX longer ventrally; very short strap or bridle-like dorsally. Segment X partly fused to basal region of cerci forming together a short dorsal concavity. Cerci heavily and entirely sclerotized, subtriangular in lateral and almost circular in caudal view. Paraproct finger-like in lateral view and completely fused to the equally strongly sclerotized cerci forming together a circular cup-like structure with the downward directed process of vestigial ventral branch of the paraproct. Gonopods particularly shaped highly diverged from the known member of the genus; gonopod apex capitate with pegged apical surface. Phallic organ is of typically *Rizeiella* type with a

single strongly sclerotized pair of aedeagal processes with pegged apex.

*Female genitalia.* There is a closed “anal tube” formed by the complex of the variously fused tergite IX and segment X. The ventral part of the tube longer in lateral view; both the dorsum and ventrum roundly excised apicomeresad. Setose sternite IX connected by less glabrous mesal plate, this ventral surface, the supragenital plate functions like the upper vaginal lip. The lower vaginal lip, the vulvar scale is membranous badly visible. Vaginal sclerite complex visible subquadrangular in dorsal view.

*Etymology.* *tavola*, coined from “távoli” remote, far away in Hungarian, refers to the locus typicus discovered on the periphery of the distributional area of the known species of the genus.

### Stenophylacini

#### *Halesus caucasicus* Oláh, 1985 stat. nov.

(Figures 424–426, Map 19)

*Halesus digitatus* (Schrank, 1781) Martynov 1926:50. “There is difference in the form of sclerites on the aedeagus between *H. digitatus* and specimens collected at River Kambelejevka near Vladikavkaz.” Misidentification.

*Halesus digitatus caucasicus* Oláh, 1985:146–147. "Holotype ♂. Caucasus, Armenia, Aragats mts. 1960 m, 27.IX.1983 leg. Varga. Deposited at the Zoological Department, Hungarian natural History Museum, Budapest. Right pair of wings mounted as dry microscopic preparation. Caustic potash-treated abdomen and the remaining part of the body stored in a single airtight selfstanding vial with 70 % ethanol together with 6 ♂ paratypes with the same data. 2 ♀ paratypes: Caucasus, Armenia, Geghard mts. 1700 m, 29.X.1983 leg. Varga."

*Halesus digitatus* ssp. *caucasicus* Oláh, 1985: Malicky 2005:576. „Ich bin nicht sicher, ob diese Unterart berechtigt ist. Die Variabilität der Tiere ist relativ groß, und eine verlässliche Unterscheidung ist kaum möglich."

**Material examined.** **Armenia**, Caucasus, Aragats Mts. 1960 m, 27.IX.1983, leg. Z. Varga (1 male, OPC). Paratypes: same as holotype (3 males, one without genitalia, OPC). Armenia, Caucasus, Geghard Mts. 1700 m, 29.X.1983 leg Z, Varga (2 males, one is without phallic organ, OPC). **Azerbaijan**, Gədəbəy district, Gədəbəy, open brook and seep S of the village 1480m, N40° 27.602' E45°43.144', 1.X.2019 leg. T. Kovács, P. Manko, D. Murányi (3 males, OPC). Gədəbəy district, Gədəbəy, bushy brook and seep S of the village, N40°27.519' E45°43.114' 1500 m, 1.X. 2019 leg. T. Kovács, P. Manko, D. Murányi (1 male, 1 associated female, OPC). Azerbaijan, Göygöl district, Göygöl N.P., forest brook below Maralgöl Lake, N40°22.855' E46°18.507', 1875 m, 30.IX.2019, leg. T. Kovács, P. Manko, D. Murányi (1 male, OPC). **Georgia**, Mtskheta-Mtianeti region, below Juta, Kora River, 42° 33'52"N 44°

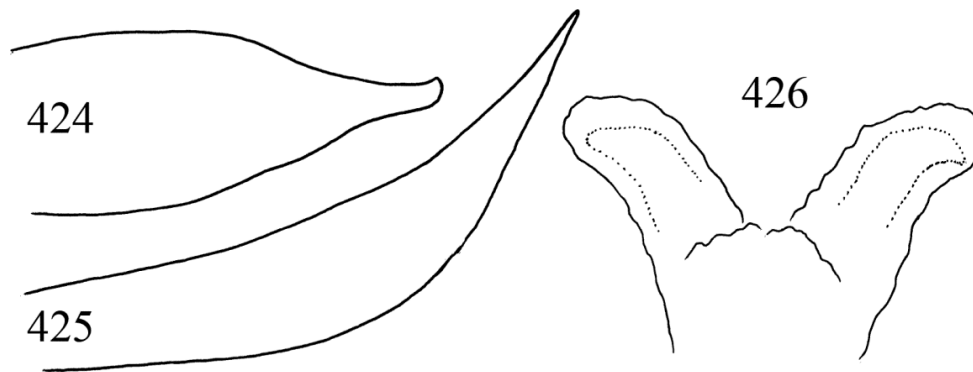
42'27"E, 1860m, 29.IX.2019, leg. G. Vinçon (3 males, OPC). Georgia, Mtskheta-Mtianeti region, Tibistskali Stream above its mouth to Terek River, 42°42'36N, 44°37'36"E, 1440m, 2.X.2019, leg. G. Vinçon (1 male, 1 female, OPC). Georgia, Imereti region, muddy spring left side lateral to the brook, Tsablarastskali tributary, 41°52'11"N, 42°47'40"E, 1670m, 28.IX.2019, leg. G. Vinçon (1 female, OPC). **Pakistan**, Kashmir, Astore, Bubin Valley, lower, 17. VIII. 2001, leg. B. Benedek & G. Ronkay, det. as *H. digitatus* (Oláh 2010) (1 male, OPC).

**Remarks.** *Halesus caucasicus* Oláh, 1985 is clearly diverged, distinct species, based on both the lateral profiles of the paraproct and of the paramere as well as on the dorsal profile of the aedeagus. The most pronounced divergence is integrated in the particular development of the endotheca producing two distinct lobes covering entirely the aedeagal sclerites. The paraproct, paramere and aedeagus shape divergences are stable on the examined entire distributional area: Armenia, Azerbaijan, Georgia, and Pakistan. Here we raise the *Halesus digitatus caucasicus* subspecies status to *Halesus caucasicus* species status.

***Halesus digitatus* (Schrank, 1781)**

(Figures 427–429, Map 19)

**Material examined.** **Albania**, Periferi Malesia, Grnçar/Gërçarë border station along the Gushinje - Shkodër road (952 m) [house walls], N42° 35.014' E19° 46.487', 14.X.2005, leg. T. Deli, Z.



**Figures 424–426.** *Halesus caucasicus* Oláh, 1985. 424 = lateral profile of the paraproct, 425 = lateral profile of the paramere, 426 = dorsal pattern of the aedeagus head.



Figures 427–429. *Halesus digitatus* (Schrank, 1781). 427 = lateral profile of the paraproct, 428 = lateral profile of the paramere, 429 = dorsal pattern of the aedeagus head.



Map 19. Distribution of *Halesus* species (full circles represent the type localities)

Eröss, Z. Fehér & D. Murányi (3 males, 4 females, HNHM). **Bulgaria**, Vitosha Mts. Kladnitsa, Sv. Nikola, Tanchovitsa, N42°34'02.9" E23°11'41.4", 1100 m, 3.X.2011, light, leg. Á. Ecsedi, T. Kovács & G. Puskás (8 males, 6 females, OPC). **Hungary**, Bükk Mts. Garadna Fish Hatchery, X. 1938, leg. J. Sátori (1 male, OPC). Hungary, Zemplén Mts. Telkibánya, 5.X. 1982, leg. J. Oláh (12 males, OPC). Hungary, Aggtelek Mts. Szelcepuszta, 30.VIII.1982, leg. J. Oláh (8 males, 5 females, OPC). **Italy**, Zoppola (PN), ponte fiu-

me Meduna T.L. 18.X.1996, leg. Pantini & Valle (2 males, 2 females, OPC). **Macedonia**, Belasica Mts. Kolesino, waterfall of the Kolesino stream in platan-beech forest above the village, 500m, N41°23' E22°48', 18.X.2006, leg. L. Dányi, J. Kontschán & D. Murányi (1 male, HNHM).

*Remarks.* The lateral profiles of the paraproct and of the paramere as well as of the dorsal profile of the aedeagus are very distinct. The most pronounced character state is the endotheca never

covering the aedeagal sclerites. The paraproct, paramere and aedeagus shape divergences are stable on the examined entire distributional area: Albania, Bulgaria, Hungary, Italy, and Macedonia.

***Halesus kampos* Oláh, sp. nov.**

(Figures 430–432, Map 19)

*Material examined.* Holotype: **Iran**, West Iran, Kandovan, 20km SE Osku, 1–2.X.1998, leg. P. Chvojka (1 male, NMPC).

*Diagnosis.* The new species is similar to *Halesus caucasicus*. The heavily sclerotized terminal pair of hook-shaped sclerites on the aedeagus and the dorsad curving and narrowing paramere are clearly diverged from *H. caucasicus*. The lateral profile of the paraproct is different forming an

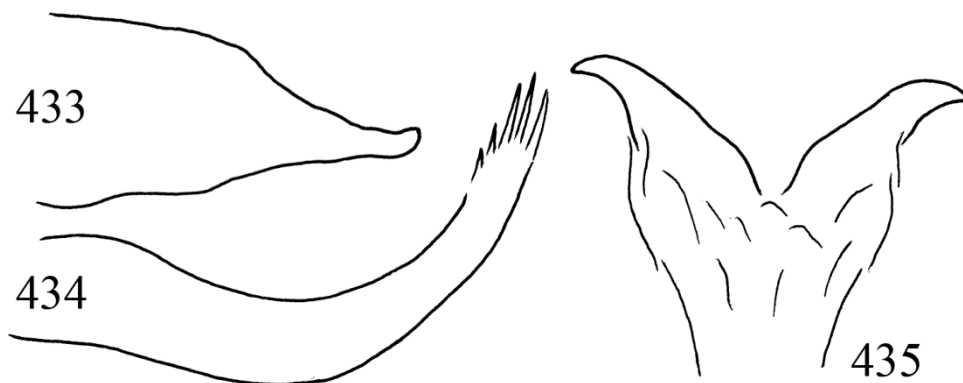
arching digitiform, almost hook shaped formation; the aedeagal sclerites are differently shaped and not covered with endotheca.

*Description.* This is a medium-sized *Halesus* species with light brown colour in alcohol. Forewing pattern faded, not distinct; forewing length is 17 mm. Segment IX is short with much reduced dorsum and ventrum. Cerci slightly elongated rounded. Gonopods narrow in lateral view with well produced lateral and mesal spine-like arms. Phallic organ composed of short phallosheath, endotheca as well as aedeagus and parameres of diagnostic shape divergences.

*Etymology.* *kampos*, coined from “kampós” hooked in Hungarian, refers to the hook-shaped formation both of the paramere and the aedeagal sclerites.



Figures 430–432. *Halesus kampos* Oláh, sp. nov. Holotype: 430 = lateral profile of the paraproct, 431 = lateral profile of the paramere, 432 = dorsal pattern of the aedeagus head.



Figures 433–435. *Halesus karmos* Oláh, sp. nov. Holotype: 433 = lateral profile of the paraproct, 434 = lateral profile of the paramere, 435 = dorsal pattern of the aedeagus head.



***Halesus karmos* Oláh, sp. nov.**

(Figures 433–435, Map 19)

*Material examined.* Holotype: **Iran**, West Iran, Kandovan, 20 km SE Osku, 1–2.X.1998, leg. P. Chvojka (1 male, NMPC).

*Diagnosis.* Similar to *Halesus kampos* sp. nov. but the single male specimen is clearly diverged. The lateral profile of the paraproct different forming a less upward curving digitiform shape, not narrowing with more elaborated apical group of spines; the aedeagal pair of sclerites are differently shaped, slender.

*Description* This is a medium-sized *Halesus* species with light brown colour in alcohol. Forewing pattern faded, not distinct; forewing length is 18 mm. Segment IX is short with much reduced dorsum and ventrum. Cerci slightly elongated rounded. Gonopods narrow in lateral view with well produced lateral and mesal spine-like arms. Phallic organ composed of short phallosome, endotheca as well as aedeagus and parameres of diagnostic shape divergences.

*Etymology.* *karmos*, coined from “karmos” claw in Hungarian, refers to the claw formation of the aedeagal sclerites.

***Potamophylax armeniacus* Mey, 1979 stat. nov.**

*Potamophylax luctuosus armeniacus* Mey, 1979a:41. “Obere, mittlere und untere Anhänge sind nur geringfügig verschieden von *luctuosus*. Penis ein Viertel kürzer als bei *luctuosus* und am Apex verbreitert. Die endständigen Borsten der Parameren sind proximal gebogen und nicht auffällig verdickt.”

*Material examined.* **Georgia**, Mtskheta-Mtianeti region, Dariali, forest brook in the Khde River valley, N42°43.904' E44°38.676', 1590 m, 12.VII.2019 leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (1 male, OPC).

*Remarks.* Based on the diverged paramere and on the locality principle this is a sibling species of *Potamophylax luctuosus* Piller & Mitterpacher, 1783.

***Potamophylax latipennis* (Curtis, 1934)**

*Material examined.* **Georgia**, Adjara, Tskhemlisi, at light in the guest house, N41°41.391' E42°09.804', 625m, 25.X.2019, leg. T. Kovács, P. Manko, D. Murányi, G. Vinçon (1 male, OPC).

***Stenophylax clavatus* Martynov, 1916**

*Material examined.* **Georgia**, Mtskheta-Mtianeti region, Juta, open springbrooks above (E of) the village, N42°34.474' E44°45.249', 2340m, 11.VII.2019, leg. T. Kovács, P. Manko, D. Murányi & G. Vinçon (1 males, OPC). **Georgia**, Mingrelia and High Svanetia region, Khaishura River tributary, same torrent above Kveda Vedi until its spring, 42°54'47" N, 42°11'05"E, 1300–1500m, 22.IX.2019, leg. G. Vinçon (1 male, OPC).

***Stenophylax muehleni* (McLachlan, 1884)**

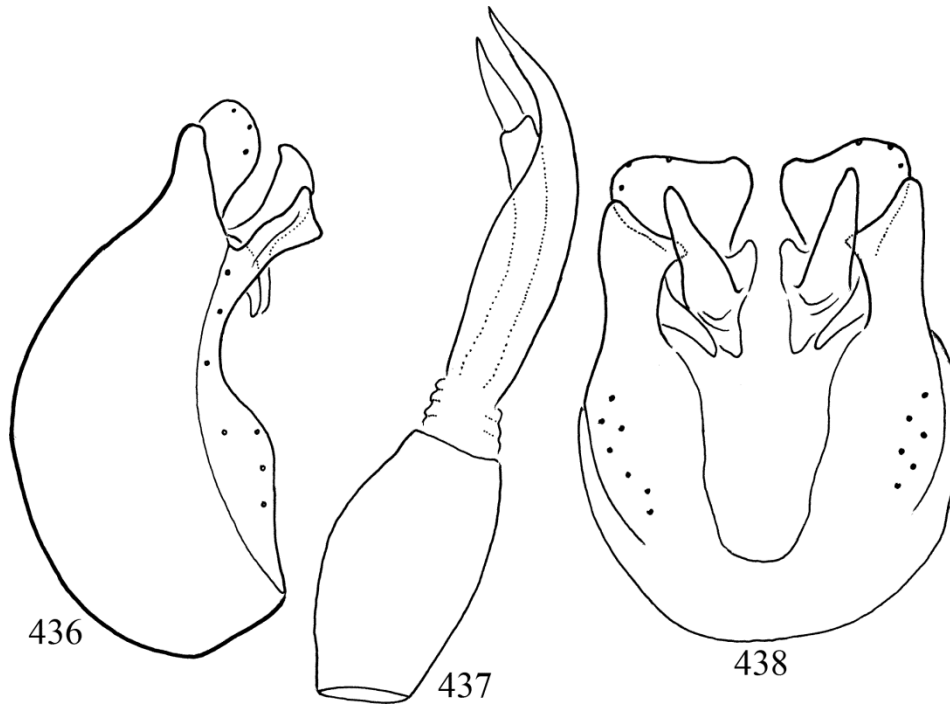
(Figures 436–438)

*Material examined.* **Kazakhstan**, Kegen Pass, N43°10'45" E79°13'13", 1700m, 24–25.VI.2019, light leg. Z. Varga (1 male, 3 females, OPC). **Kazakhstan**, Dardamty, stream, N43°26'42" E80°00'57", 1286m, 27. VI.2019, light leg. Z. Varga (4 males, OPC).

*Remarks.* Here we have drawn the specimens from Kazakhstan having diverged shape of cerci and gonopod head in caudal view. However, the phallic organ is identical with the specimens from Turkey, Iran and Turkmenistan. Cercus and gonopod divergences are probably typical standing variations of non-adaptive traits.

***Stenophylax nycterobius* species complex**

*Stenophylax nycterobius* is a large cavernicolous insect with reddish testaceous wings of around 20 mm. It is a species of long-range flyer and widely distributed in Europe. Several sibling species have been organised on the periphery of its large distributional area: *Stenophylax badukus* (Mey & Müller, 1979), Russia (West Caucasus); *S. ilgazicus* (Sipahiler, 2015), Turkey (Ilgaz Mt.);



**Figures 436–438.** *Stenophylax muehleni* (McLachlan, 1884). 436 = male genitalia in left lateral view, 437 = male genitalia in caudal view, 438 = phallic organ in lateral view.

*S. libana* (Malicky & Dia, 1997), Libanon (Quelle Afqa), *S. tascale* (Sipahiler, 2015), Turkey (Tas-kale); *S. thaleri* (Malicky, 1985), Marocco (High Atlas), *S. vallas* sp. nov. Georgia (Adjara). These integratively organised siblings are diverged from their ancestor *S. nyterobius* in allopatry of isolated sky-islands and adapted to high altitude environment. They are characterised by smaller size, brachyptery and chaetopterygini-type of variously enforced erected hairs both on wing veins and on wing membrane.

***Stenophylax badukus* Mey & Müller, 1979**

(Map 20)

*Material examined.* **Russia**, West Caucasus, Teberda Nature Reserve, 2.X.1952, leg. E. Arens (1 male, OPC).

***Stenophylax vallas* Oláh & Kovács, sp. nov.**

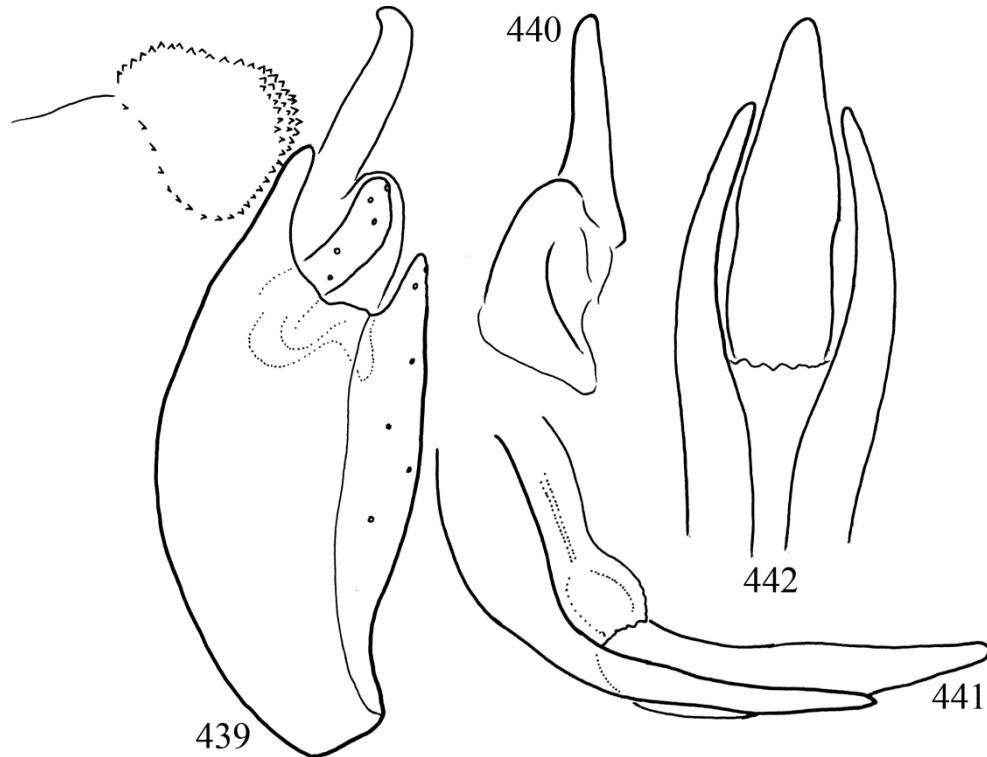
(Figures 439–442, Map 20, Photo 32)

*Material examined.* Holotype: **Georgia**, Adjara, downflow of the Mtsvane Tba (Green Lake), N

of Goderdzi Pass, N41°40'41.49" E42°29'54.69", 2055m, 27.IX.2019, leg. T. Kovács (1 male, OPC).

*Diagnosis.* Among the siblings *Stenophylax vallas* sp. nov. is most close to *S. badukus*, but differs by having forewing with dense cover of erect hairs, not scarce; paraproct straight digitiform, not tapering and not curving; ventral branch of paraproct upward shouldered, not laterad; free head of gonopod low, not high; apical half of the aedeagus heavily sclerotized, almost completely black, not membranous; apex of aedeagus narrowing, pointed, not wide and not excised.

*Description.* (In alcohol) Small-sized dark species with dark brown and greyish body and wing colour. Its forewing length is 9 mm with rounded apices. Forewing veins and membrane densely covered with strong and long erect hairs. Spur number 034. Tergite VIII with much developed black setose protuberance divided by a middle line. Segment IX is extremely short and high, parallel-sided with gradual narrowing dorsad re



**Figures 439–442.** *Stenophylax vallas* Oláh & Kovács sp. nov. Holotype: 439 = male genitalia in left lateral view, 440 = left paraproct in caudal view, 441 = phallic organ in lateral view, 442 = phallic organ in ventral view.

sulted in a very short band-like dorsum; narrowing but longer ventrad. Cerci band-like slightly curving dorsad and mesad. Paraproct much produced dominating on the genital structure; the dorsal branch of the paraproct straight digitate both in lateral and caudal view; its apices blunt not narrowing and not pointed; ventral branch produced upward forming a distinct shoulder pronounced both in lateral and caudal view. Gonopods almost vertical directed, narrowly fused to segment IX with low free apices. Phallic organ composed of the upward curving aedeagus and the strong spine-like paramere; upward curving apical half of the aedeagus is heavily sclerotized, black and narrowing apicad; parameres shorter than aedeagus.

*Etymology.* *vallas*, from “vállas” shouldered in Hungarian, refers to the extremely enlarged shape of the ventral branch of the paraproct producing a distinct shoulder-like enlargement well visible both in lateral and caudal view.

### *Stenophylax permistus* McLachlan, 1895

(Map 20)

*Material examined.* **Georgia**, Adjara, Tskhemlisi, at light in the guest house, N41°41.391' E42°09.804', 625m, 25.IX.2019, leg. T. Kovács, P. Manko, D. Murányi, G. Vinçon (1 female, OPC).

### *Stenophylax solotarewi* species complex

*Stenophylax solotarewi* species complex has extremely short segment IX like *S. fissus*, *S. malaspinus*, *S. malatestus*. Together they may form an independent species group. Members of the *S. solotarewi* species complex, *S. caspicus* from Iran and *S. lazareus* from Russia have been synonymised with *S. solotarewi* (Malicky 2005). However, these synonymies are produced apophantically (Oláh et al. 2019) without any documentation or explanation. Here we describe a new species, *Stenophylax ujjas* and reinstate the spe

cies status of *S. caspicus* and *S. lazareus* based on comparative studies and drawings of both the phallic and periphallic organs.

***Stenophylax caspicus* (Schmid, 1959) stat. rest.**

(Figures 443–446)

*Micropterna caspica* Schmid, 1959:784–785. Described from the Northern coast of Iran.

*Micropterna caspica* Schmid, 1959; Malicky 2005: 578. Based on Grigorenko suggestion (i. l.) synonymised with *Micropterna solotarewi* Martynov, 1913 without any documentation or explanations.

*Remarks.* Comparison with the sibling species is based on the phallic organ and the periphallic organs drawn in caudal view. In caudal view cerci with ovoid dorsomesal lobe, paraprocts very thin and pointing without pronounced triangular lateral process; gonopods truncate in lateral view, without mesal excision in caudal view forming small lateral middle and mesal lobes. Aedeagus charac

terized by anterad curving apical half. This character combination delineates this species from the three siblings of the *Stenophylax solotarewi* species complex.

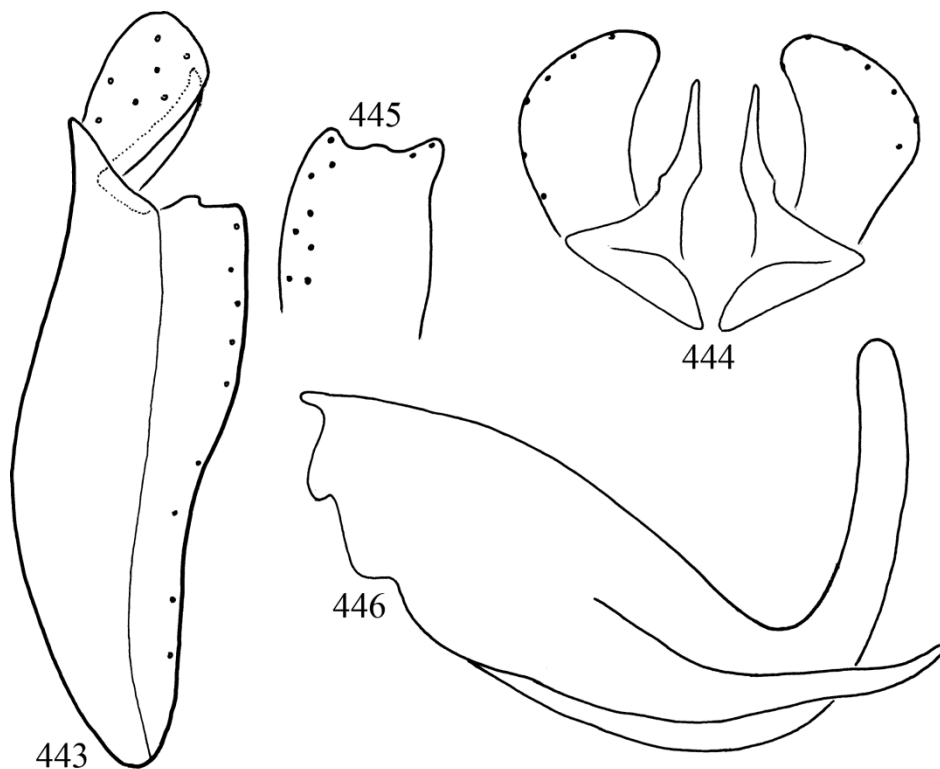
***Stenophylax lasarea* (Oláh, 1985) stat. rest.**

(Figures 447–452, Map 20)

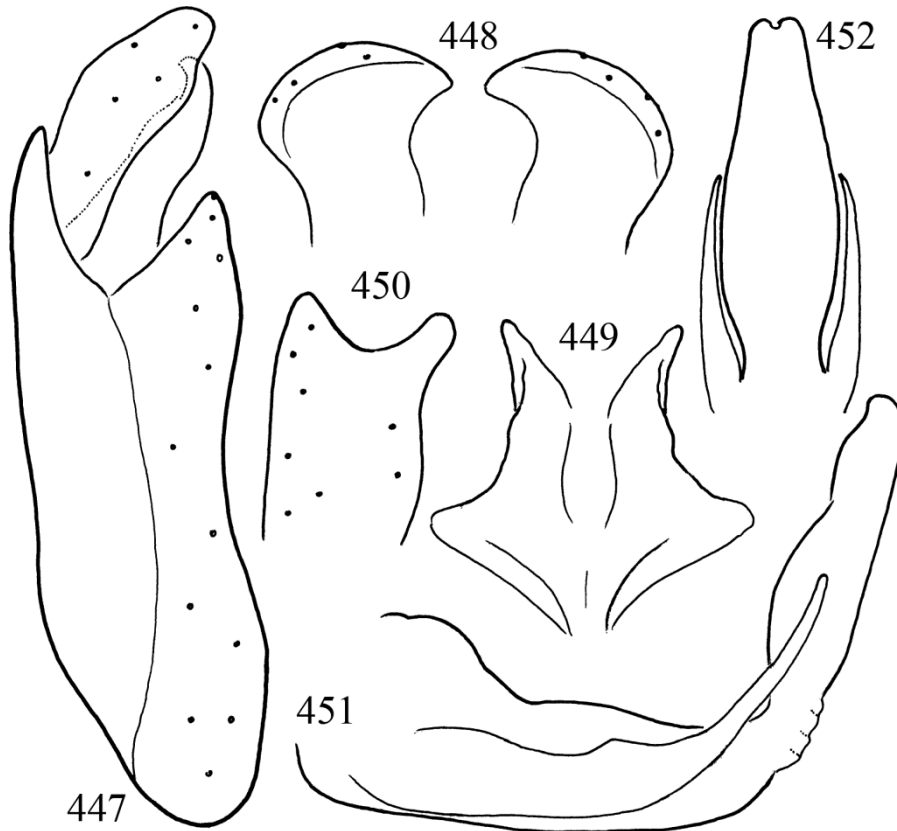
*Micropterna lasarea* Oláh, 1985: 147–148. Northern slope of the Caucasus, low altitude, the very foothill at Goryatskiy Klyuts, Krasnodar District.

*Micropterna lasarea* Oláh, 1985; Malicky 2005:578. Based on Grigorenko suggestion (i. l.) synonymised with *Micropterna solotarewi* Martynov, 1913 without any documentation or explanations.

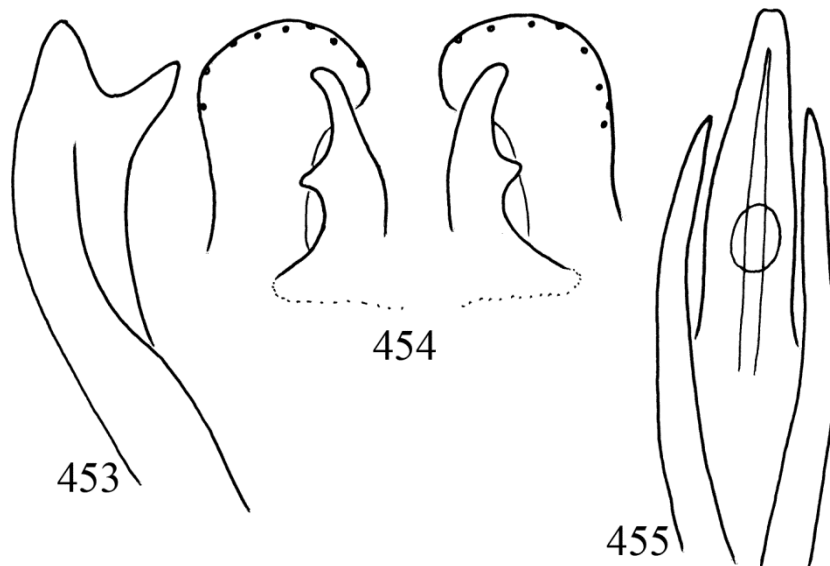
*Material examined.* Holotype: **Russia**, Northern slope of Caucasus, Krasnodar District, Goryatskiy Klyuts, near fish hatchery, 10.V.1952, leg. Pankrapova (deposited in the Zoological Institute, Leningrad).



**Figures 443–446.** *Stenophylax caspicus* (Schmid, 1959). 443 = male genitalia in left lateral view, 444 = cerci and paraprocts in caudal view, 445 = left gonopod tip in caudal view, 446 = phallic organ in lateral view.



Figures 447–452. *Stenophylax lasarea* (Oláh, 1985). 447 = male genitalia in left lateral view, 448 = cerci in caudal view, 449 = paraprocts in caudal view, 450 = left gonopod tip in caudal view, 451 = phallic organ in lateral view, 452 = apical region of phallic organ in ventral view.



Figures 453–455. *Stenophylax solotarewi* (Martynov, 1913). 453 = left gonopod tip in caudal view, 454 = cerci and paraprocts in caudal view, 455 = phallic organ in ventral view.

*Remarks.* Comparison with the sibling species is based on the phallic organ and the periphallic organs drawn in caudal view. In caudal view cerci with pointed dorsomesal lobe, paraprocts without pronounced triangular lateral process; gonopods tapering in lateral view, deep excised in caudal view forming lateral and mesal lobes; mesal lobe is blunt. Aedeagus is slightly tapering along its upward curving apical half with constricted middle narrowing in ventral view. This character combination delineates this species from the three siblings of the *Stenophylax solotarewi* species complex.

***Stenophylax solotarewi* (Martynov, 1913)**

(Figures 453–455, Map 20)

*Micropterna solotarewi* Martynov, 1913:97–98. “1♂  
1♀. Teberda, Kuban Oblast.”

*Remarks.* The single male type specimen is not available for study; it has been lost probably during the Second World War. Comparison with the sibling species is based on the phallic organ and the periphallic organs drawn in caudal view. In caudal view cerci with oviform dorsomesal lobe, paraprocts with pronounced triangular lateral process; gonopods not drawn in lateral view, deep excised in caudal view forming lateral and mesal lobes; mesal lobe is tapering. Aedeagus is tapering along its upward curving apical half in ventral view. This character combination delineates the nominate species from the three siblings of the *Stenophylax solotarewi* species complex.

***Stenophylax ujjas* Oláh & Kovács, sp. nov.**

(Figures 456–460, Map 20, Photo 26)

*Material examined.* Holotype: **Georgia**, Adjara, Khabelashvilebi, Bird Spring, above (N of) the village, N41°45.063' E42°11.313', 2010m, 28.IX. 2019, leg. T. Kovács, D. Murányi (1 male, OPC).

*Diagnosis.* Comparison with the sibling species is based on the phallic organ and the periphallic organs drawn mostly in caudal view. In caudal view cerci with oviform dorsomesal lobe, paraprocts without triangular lateral process, but

with regular digitate apical half and double broad basal half; gonopods rounded ovoid in lateral view, shallow excised in caudal view forming lateral and mesal lobes. Aedeagus is almost parallel-sided along its upward curving apical half in ventral view. This character combination delineates this new species from the three siblings of the *Stenophylax solotarewi* species complex.

*Description.* (In alcohol) Medium-sized light faded animal with yellowish, stramineous body and wing colour. Its forewing length is 15 mm. Segment IX extremely short and high, parallel-sided with gradual narrowing dorsad resulted in a very short band-like dorsum; narrowing ventrad and vestigial, at least the enlarged gonopods dominate ventrad. Cerci elongated dorsad in lateral view; ovoid dorsad and turning mesad in caudal view. Paraproct thin, apical half of the dorsal branch regular digitate, basal half double broad; ventral branch of the paraproct triangular horizontally and produced laterad. Gonopods almost vertical directed, enlarged longer than segment IX, with rounded ovoid apex in lateral view; bilobed in caudal view. Phallic organ composed of the right-angled upward directed aedeagus and spine-like paramere with vertically flat, plate-like, broad-based basal two-thirds; upward-curving apical half of the aedeagus almost parallel-sided in ventral view.

*Etymology.* *ujjas*, from “ujjas” supplied with fingers in Hungarian, refers to the slender digitate shape of the apical half of the dorsal branch of the paraproct.

**Integripalpia**

**Brevitentoria**

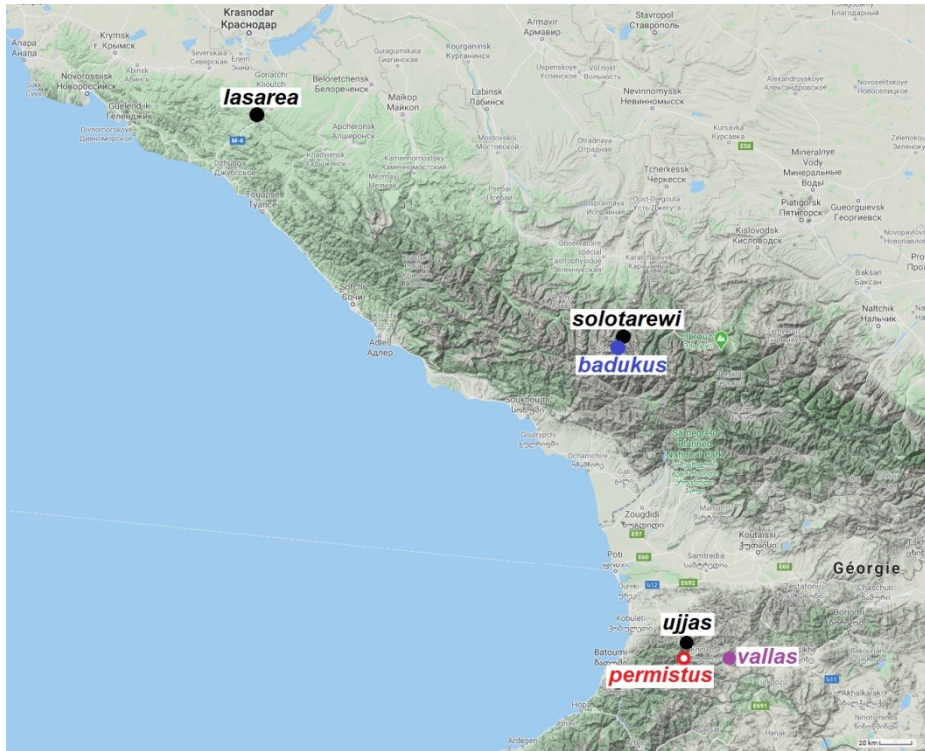
**Leptoceroidea superfamily**

**Leptoceridae**

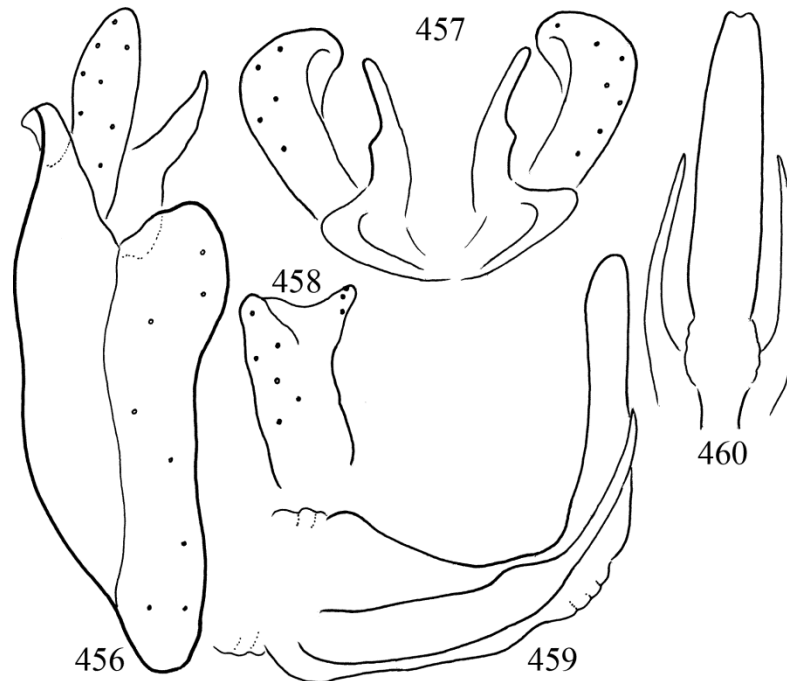
***Adicella androconifera* Schmid, 1959**

(Figure 461–464)

*Material examined.* **Azerbaijan**, Lankaran district, south-west from Lankaran, stream (woody vegetation, village) tributary of Lankaran river;



Map 20. Distribution of *Stenophylax* species (full circles represent the type localities)



Figures 456–460. *Stenophylax ujjas* Oláh & Kovács, sp. nov. Holotype: 456 = male genitalia in left lateral view, 457 = cerci and paraprocts in caudal view, 458 = left gonopod tip in caudal view, 459 = phallic organ in lateral view, 460 = phallic organ in ventral view.

N38.7164444° E48.7382778°, 75 m, 3.VI.2017, leg. L. Hrivniak (1 male, OPC).

*Remarks.* Compared with the original drawings of the species described from Iran we have found some divergences at the single Azerbaijan specimen in the ventral profile of the gonopods as well as in the lateral profile of the upper part of segment X. Here we redrawn the specimen collected in Azerbaijan.

***Athripsodes fulvicornis* Martynov, 1913**

*Material examined.* **Georgia**, Kvemo Kartli region, Aiazmi, Zhamindzori Stream above (S of) the village, N41°33.579' E43°54.282', 1755m, 15.VII.2019, leg. T. Kovács, D. Murányi & G. Vinçon (3 males, OPC). **Georgia**, Kvemo Kartli region, Tskhrakudaani, Algeti River above (W of) the village, N41°40.534' E44°22.772', 1010m, 15.VII.2019, leg. T. Kovács, D. Murányi & G. Vinçon (1 male, OPC).

**Integripalpia**

**Brevitentoria**

**Sericostomatoidea superfamily**

**Beraeidae**

***Ernodes ordubadensis* Oláh & Kerimova, sp. nov.**

(Figures 465–468, Photo 51)

*Material examined.* **Azerbaijan**, Nakhchivan AR, Ordubad District, Tivi village, river Tivi, sweep netting, N39°8'0.24" E 45°55'47.07", 25.VI. 2019, leg. I. Kerimova (1 male, OPC). Paratype: same as holotype (1 male, OPC).

*Description and diagnosis.* Male (in alcohol). Sclerites on body and legs castanean brown. Forewing length 5 mm. Body characters are similar to *Ernodes saltans* Martynov, 1913 described from Georgia. A sibling species of *E. saltans* has been described from Turkey, Artvin: *Ernodes macahelensis* Sipahiler, 1997. *Ernodes ordubadensis* sp. nov. described here from Nakhchivan of Azerbaijan is the third species of *E*

*saltans* species complex and probably many more siblings live in various mountain ranges of the Caucasus organised by paraproct and paramere divergences. The new species has paraproct with extremely enforced and enlarged basal half of the paraproct and its arching region is very deep; it is shallow in *E. saltans* and slightly deepened in *E. macahelensis*. The curvature pattern of paramere is also diverged between the three sister species. Moreover, the long apicomeresal spine-like process, a unique character state of the *Ernodes saltans* species complex is also differently shaped between the three sister species.

*Etymology.* Named after the region of the type locality. Ordubad is a rayon of Azerbaijan in the Nakhchivan Autonomous Republic. Ordubad is a name of Turco-Persian origin and means „city of army” from Turkic *ordu* (army) and Persian *bad* (city).

***Ernodes palpatus* Martynov, 1909**

*Material examined.* **Georgia**, Mtskheta-Mtianeti region, Mejilauri, forest and bushy springs and outlets, N42°19.423' E44°38.732', 1270m, 13.VII.2019, leg. T. Kovács, P. Manko D. Murányi & G. Vinçon (3 males, 4 females, OPC). **Georgia**, Kvemo Kartli region, forest brooks and seep along the Tbilisi-Tsalka main road, N41°40.166' E44°19.191', 1495m, 15.VII.2019, leg. T. Kovács, D. Murányi & G. Vinçon (5 males, 8 females, OPC).

**Sericostomatidae**

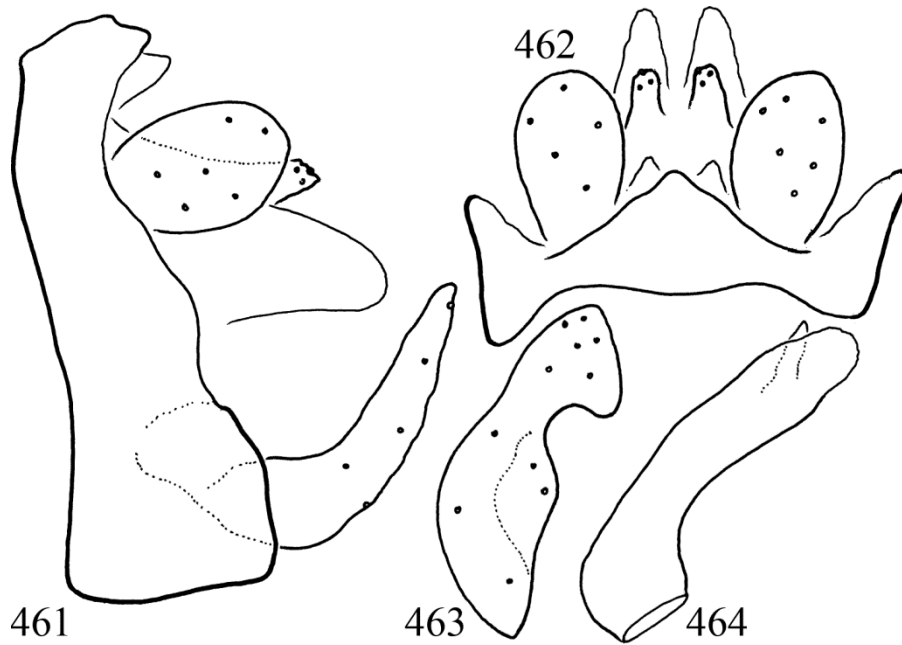
***Cerasma cairon* Malicky, 1986**

*Material examined.* **Turkey**, Artvin, Cancurtalan, 800m, 1-2.VII.1996, leg. A. Podlussány (1 male, HNHM; 1 male, OPC).

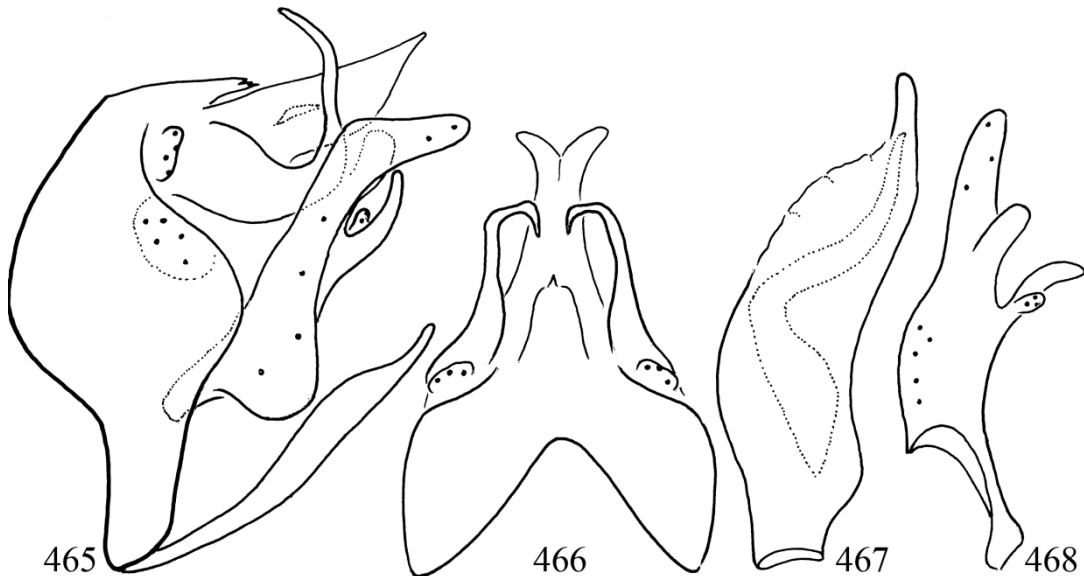
***Cerasma cornuta* McLachlan, 1876**

*Material examined.* **Georgia**, Samtskhe-Javakheti region, 1 km before Adjarian border, torrent and cascade, < Goderdzi Pass, Dzindzitskali tributary N41°38'23" E42°34'56", 1680–1800m,





**Figures 461–464.** *Adicella androconifera* Schmid, 1959. Holotype: 461 = male genitalia in left lateral view, 462 = male genitalia in dorsal view, 463 = left gonopod ventral view, 464 = phallic organ in lateral view.



**Figures 465–468.** *Ernodes ordubadensis* Oláh & Kerimova, sp. nov. Holotype: 465 = male genitalia in left lateral view, 466 = male genitalia in dorsal view, 467 = left gonopod ventral view, 468 = phallic organ in lateral view.

16.VII.2019, leg. G.Vinçon (3 males, OPC). Georgia, Gouria region, brooklet, tributary of Bzhuzhi River, above Gomi, 41°52'25"N 42°06'19"E, 390m, 24.IX.2019, leg. G. Vinçon (2 males,

OPC). Georgia, Samtskhe-Javakheti region, Fontaine, brook and spring, > Zarzma village, N41°40'22" E42°38'22", 1300m, 16.VII.2019, leg. G. Vinçon (1 male, OPC).

***Schizopelex cachetica* Martynov, 1913**

**Material examined.** Georgia, Imereti region, brooks, Tsablarastskali tributaries, above Kur Sairmi, N41°56'50" E42°45'33", 1300m, 17.VII. 2019, leg. G. Vinçon (1 male, OPC).

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**Appendix 1.** Habitat photos of the collecting localities



**Photo 1.** Georgia, Svanetia: Egrisi mountain range above Kveda Vedi (G. Vinçon)



**Photo 2.** Georgia, Svanetia: torrent and springs above Kveda Vedi, 42°54'47" N, 42°11'05"E, 1300-1500m (G. Vinçon)  
(*Wormaldia davidi* Oláh & Vinçon, sp. nov., *Rhyacophila kveda* Oláh & Vinçon, sp. nov.)



**Photo 3.** Georgia, Svanetian mountains, view from the Nakra Valley (G. Vinçon)



**Photo 4.** Georgia, Svanetia, Nakra valley, spring Utviri tributary, 43°04'49" N, 42°19'41" E, 2500m (G. Vinçon) (*Wormaldia harma* Oláh & Vinçon, sp. nov., *Rhyacophila nakra* Oláh & Vinçon, sp. nov., *Kelgena parhuza* Oláh & Vinçon, sp. nov., *K. svanetica* Oláh & Vinçon, sp. nov., *K. topora* Oláh & Vinçon, sp. nov.)



**Photo 5.** Georgia, Svanetia, Nakra valley, brooklet Utviri tributary, 43°04'49" N, 42°19'41"E, 2300-2500m (G. Vinçon)  
(*Wormaldia harma* Oláh & Vinçon sp. nov., *Rhyacophila nakra* Oláh & Vinçon sp. nov., *Kelgena parhuza* Oláh & Vinçon sp. nov., *K. svanetica* Oláh & Vinçon sp. nov., *K. topora* Oláh & Vinçon sp. nov.)





**Photo 6.** Georgia, Imereti, karst torrent, N42°27.405' E42°35.948', 310 m (D. Murányi) (*Drusus janjulae* Oláh, sp. nov.)



**Photo 7.** Georgia, Imereti, karst torrent, N42°27.405' E42°35.948', 310 m (D. Murányi) (*Drusus janjulae* Oláh sp. nov.)



**Photo 8.** Georgia, Mtskheta-Mtianeti, Gudauri, brook Aragvi tributary, N42°29.521' E44°28.037', 2250m (G. Vinçon) (*Drusus erdes* Oláh & Vinçon sp. nov.)



**Photo 9.** Georgia, Mtskheta-Mtianeti, Kazbeg Mount, view from Trinity Church (G. Vinçon)



**Photo 10.** Georgia, Mtskheta-Mtianeti, Kazbeg Mount, Chkheri River mountain shelter (G. Vinçon) (*Drusus sukul* Oláh & Vinçon, sp. nov.)



**Photo 11.** Georgia, Mtskheta-Mtianeti, side spring of Chkheri River beneath Altihut 3014 mountain shelter, N42°39.596' E44°33.797', 2940m (D. Murányi) (*Drusus sukul* Oláh & Vinçon, sp. nov.)



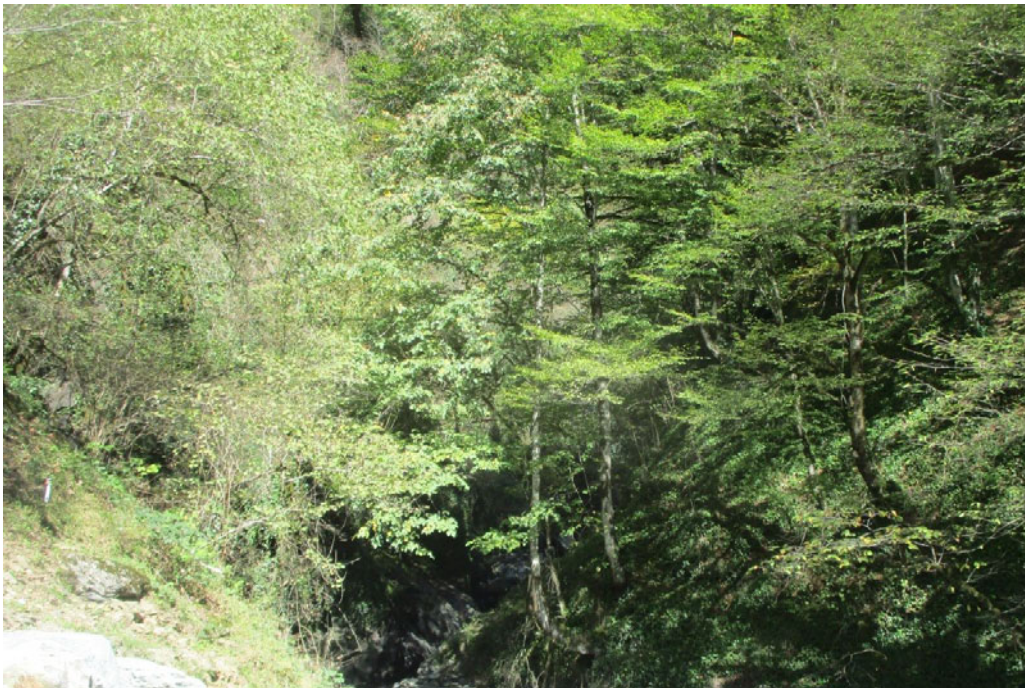
**Photo 12.** Georgia, Mtskheta-Mtianeti region, Tibistskali Stream, 42°42'36N, 44°37'36"E, 1440m (G. Vinçon) (*Badukiella kinula* Oláh & Vinçon, sp. nov.)



**Photo 13.** Georgia, Mtskheta-Mtianeti, tributary of Terek River, below Tsdo village, 42°40'56.379"N, 44°37'58.846"E, 1710m (P. Manko) (*Wormaldia holaga* Oláh & Manko, sp. nov.)



**Photo 14.** Georgia, Mtskheta-Mtianeti, Snostskali River at Sno Castle, N42°36.306' E44°38.290', 1770m (D. Murányi) (*Drusus csupasz* Oláh, sp. nov.)



**Photo 15.** Georgia, Kakheti, above Lechuri, torrent tributary of Stori Aragvi, 42°12'19"N, 45°27'45"E, 880m (G. Vinçon) (*Wormaldia kimera* Oláh & Vinçon sp. nov., *Drusus megnot* Oláh & Vinçon sp. nov. )



**Photo 16.** Georgia, Kakheti, above Lechuri, big torrent, tributary of Stori Aragvi River, 42°12'19"N, 45°27'45"E, 880m (G. Vinçon) (*Wormaldia kimera* Oláh & Vinçon, sp. nov., *Drusus megnot* Oláh & Vinçon, sp. nov.)





**Photo 17.** Georgia, Kakheti, Telavi, Khrukiaskhevi River and side brook, N41°53.988' E45°29.243', 775m (D. Murányi)  
(*Wormaldia kitera* Oláh sp. nov.)



**Photo 18.** Georgia, Gouria, Gouria Mountains from Bzhuzhi valley above Gomi (G. Vinçon)



**Photo 19.** Georgia, Gouria, brook and spring, tributary of Bzhuzhi, 41°50'49"N, 42°07'31"E, 920m (G. Vinçon) (*Rizeiella ereda* Oláh & Vinçon sp. nov.)



**Photo 20.** Georgia, Gouria, view from nearly 1700m (G. Vinçon)



**Photo 21.** Georgia, Gouria, spring and brooks, tributary of Bzhuzhi, below Gomismta, 41°49'57" N, 42°09'21"E, 1910-1980m (G. Vinçon) (*Agapetus gouriensis* Oláh & Vinçon, sp. nov., *Rizeiella bayae* Vinçon & Oláh, sp. nov.)



**Photo 22.** Georgia, Gouria, spring and two torrents with snow, tributary of Bzhuzhi River, 41°49'51"N, 42°09'05"E, 1750m (G. Vinçon) (*Rhyacophila gouria* Oláh & Vinçon, sp. nov.)



**Photo 23.** Georgia, Adjara, Kintrishi Nature Reserve, above Khino, above 2300m (G. Vinçon)



**Photo 24.** Georgia, Adjara, Kintrishi Nature Reserve, above Khino, spring and brook, 41°45'31"N 42°06'50"E, 2300m (G. Vinçon) (*Apataniana kintrisha* Oláh & Vinçon, sp. nov., *Chaetopteryx vinconi* Oláh & Kovács, sp. nov., *Rizeiella bayae* Vinçon & Oláh, sp. nov.)



**Photo 25.** Georgia, Adjara, Tsivadzeebi, forest brook, N41°39.939' E42°08.857', 495m (P. Manko) (*Diplectrona georgica* Oláh & Vinçon, sp. nov.)



**Photo 26.** Georgia, Adjara, Khabelashvilebi, Bird Spring, above the village, N41°45.063' E42°11.313', 2010m (D. Murányi)  
(*Rizeiella oldala* Oláh & Kovács, sp. nov., *Stenophylax ujjas* Oláh & Kovács, sp. nov.)



**Photo 27.** Georgia, Adjara region, Mtirala National Parc, above Chakvistavi, tributary of Sachokhia River, 41°39'28" N, 41°52'30"E, 1000m (G. Vinçon) (*Drusus teslenkoae* Oláh & Vinçon, sp. nov., *Rizeiella odva* Oláh & Vinçon, sp. nov.)





**Photo 28.** Georgia, Adjara region, Mtirala National Parc, above Chakvistavi, brook, 41°38'51" N, 41°52'56"E, 1200m (G. Vinçon) (*Rhyacophila mtirala* Oláh & Vinçon, sp. nov., *R. sacokia* Oláh & Vinçon, sp. nov., *R. kimara* Oláh & Vinçon, sp. nov.)



**Photo 29.** Georgia, Adjara, Goderdzi Pass, 1900m (G. Vinçon)



**Photo 30.** Georgia, Adjara, brook and spring, < Goderdzi Pass, Dzindzitskali tributary, N41°37'57" E42°32'38", 1900m (G. Vinçon) (*Wormaldia tomora* Oláh & Vinçon, sp. nov.)



**Photo 31.** Georgia, Adjara, brook and spring, Goderdzi Pass, after Beshumi Botanic Garden, N41°37'17" E42°32'16", 1970m (G. Vinçon) (*Sakala adjarica* Oláh & Vinçon, sp. nov., *Kelgena adjarica* Oláh & Kovács, sp. nov.)



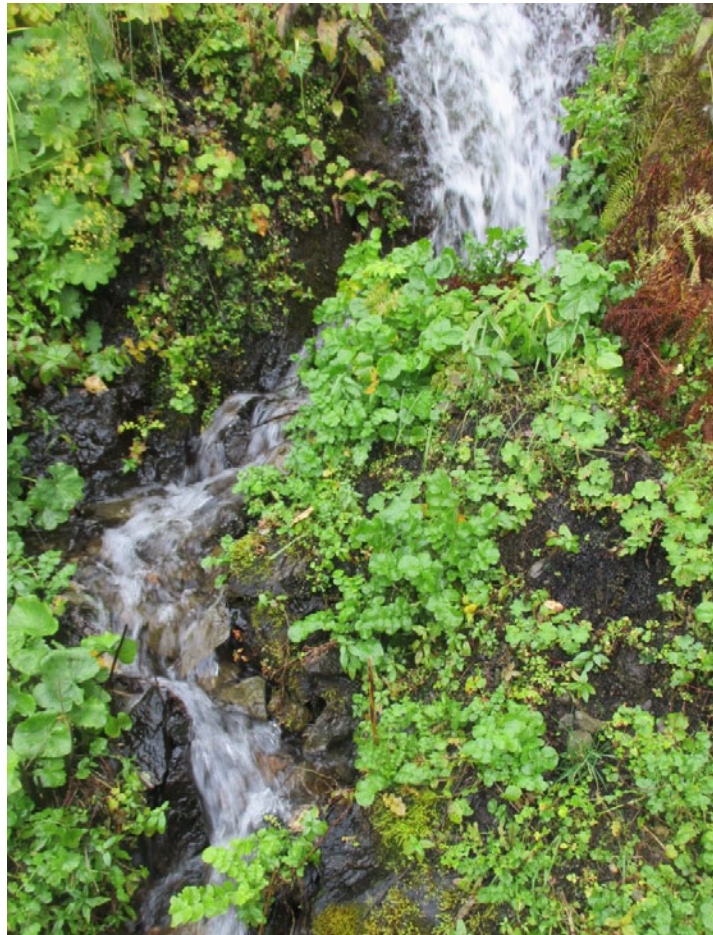
**Photo 32.** Georgia, Adjara, Mtsvane Tba (Green Lake), N of Goderdzi Pass, N41°40.469' E42°29.892', 2075m (P. Manko) (*K. tolaka* Oláh & Kovács, sp. nov.). In a small outlet beneath the lake occur *Apataniana goderdza* Oláh & Kovács, sp. nov., *Kelgena adjarica* Oláh & Kovács, sp. nov. and *Stenophylax vallas* Oláh & Kovács, sp. nov.



**Photo 33.** *Kelgena tolaka* Oláh & Kovács sp. nov. (T. Kovács)



**Photo 34.** Georgia, Iméréthie, Zekari pass, north slope (G. Vinçon)



**Photo 35.** Georgia, Iméréthie region, steep brook and spring, north slope of Zekari pass, 41°50'55"N, 42°47'43"E, 2080m (G. Vinçon) (*Drusus erdes* Oláh & Vinçon, sp. nov., *Kelgena imeretica* Oláh & Vinçon, sp. nov., *Rizeiella tavola* Oláh & Vinçon, sp. nov.)



**Photo 36.** Georgia, Iméréthie, steep brook and spring, N. Zekari pass, 41°50'45"N, 42°48'31"E, 2150-2200m (G. Vinçon)  
(*Rhyacophila zekara* Oláh & Vinçon, sp. nov., *Badukiella kurta* Oláh & Vinçon, sp. nov.,  
*Kelgena imeretica* Oláh & Vinçon, sp. nov.)



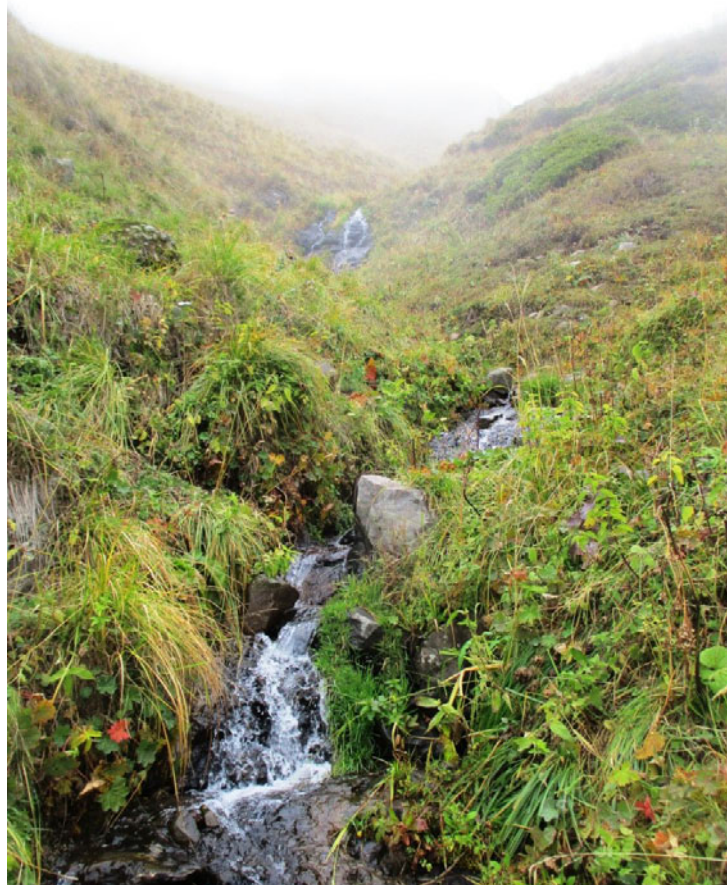
**Photo 37.** Georgia, Samtskhé-Djavakhétie region, south slope of Zekari pass, 41°49'13"N 42°52'07"E (G. Vinçon) (*Kelgena bunka* Oláh & Vinçon, sp. nov.)



**Photo 38.** Georgia, Samtskhé-Djavakhétie region, Brook and spring, south Zekari pass, 41°49'13"N 42°52'07"E, 2000-2050m (G. Vinçon) (*Kelgena bunka* Oláh & Vinçon, sp. nov.)



**Photo 39.** Georgia, Samtskhé-Djavakhétie, western Trialeti mountains above Bakuriani (G. Vinçon) (*Apataniana bacurianica* Oláh & Vinçon, sp. nov., *Badukiella kurta* Oláh & Vinçon, sp. nov., *Kelgena bakurianica* Oláh & Vinçon, sp. nov.)



**Photo 40.** Georgia, Samtskhé-Djavakhétie, spring and brooklet, tributary of Borjomula River, above Bakuriani, 41°41'35"N, 43°31'02"E, 2270–2350m (G. Vinçon) (*Apataniana bacurianica* Oláh & Vinçon, sp. nov., *Kelgena bakurianica* Oláh & Vinçon, sp. nov.)





**Photo 41.** Georgia, Samtskhé-Djavakhétie, mountains above Bakuriani (G. Vinçon) (*Apataniana bacurianica* Oláh & Vinçon, sp. nov., *Badukiella kurta* Oláh & Vinçon, sp. nov., *Kelgena bakurianica* Oláh & Vinçon, sp. nov.)



**Photo 42.** Georgia, Kvemo Kartli region, mountains surrounding Nardevani (G. Vinçon)



**Photo 43.** Georgia, Kvemo Kartli region, Nardevani, open brook and seeps, N41°32.991' E43°53.232', 1915m (G. Vinçon)  
(*Hydropsyche ejsaka* Oláh ,sp. nov., *Drusus alapos*, Oláh sp. nov.)



**Photo 44.** Azerbaijan, Gədəbəy district, Gədəbəy, bushy brook and seep, N40°27.519' E45°43.114', 1500m (D. Murányi)  
(*Wormaldia obola* Oláh, sp. nov.)



**Photo 45.** Azerbaijan, Gədəbəy district, Qualakənd, small side brook of the tributary of the Şemkirçay r., big stream S of the village, N40°27.218' E45°43.045', 1520m (P. Manko) (*Drusus mankoi* Oláh, sp. nov.)



**Photo 46.** Azerbaijan, Gədəbəy district, Qualakənd, tributary of the Şemkirçay r., big stream S of the village, N40°27.218' E45°43.045', 1520m (D. Murányi) (*Drusus mankoi* Oláh, sp. nov.)



**Photo 47.** Azerbaijan, Şəki district, Şəki, Quirxbulaq, karst brook, N41°08.786' E47°15.532', 595m (P. Manko) (*Wormaldia hoska* Oláh, sp. nov.)



**Photo 48.** Azerbaijan, Şəki district, Kiş, karst spring and brook by Galarsan ruin, N41°15.906' E47°13.631', 1330m (P. Manko) (*Wormaldia sakaorum* Oláh, sp. nov.)



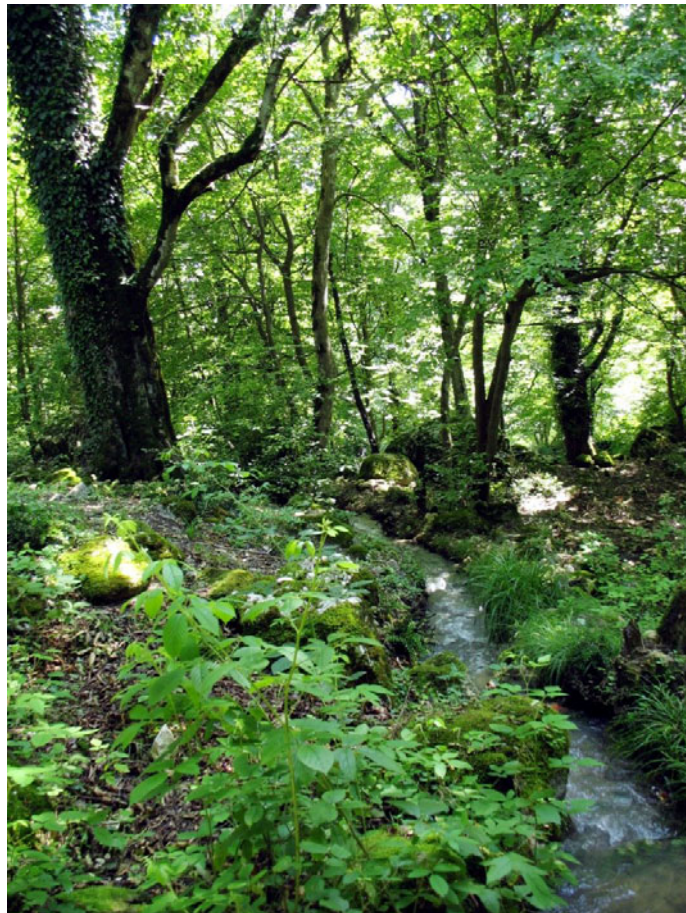
**Photo 49.** Azerbaijan, Daşkəsən district, Guneykənd, open stream, N40°29.021' E45°54.080', 1575m (D. Murányi)  
(*Hydropsyche sukula* Oláh, sp. nov. It occurs in the river or in a side spring).



**Photo 50.** Azerbaijan, Goygol District, Togana village, river Kurekchay, N40°25'32.30", E46°18'54.05", 1244m (R. Amiraslanoghlu) (*Hydropsyche togana* Oláh & Kerimova, sp. nov.)



**Photo 51.** Azerbaijan, Nakhchivan AR, Ordubad District, Tivi village, river Tivi, N 39° 8'0.24" E 45°55'47.07" (N. Snegovaya)  
(*Ernodes ordubadensis* Oláh & Kerimova, sp. nov.)



**Photo 52.** Iran, N. Iran, Mazandaran Province, stream 10 km S Galugah, 36°41.1'N 53°46.3'E, 550m (P. Chvojka)  
(*Rhyacophila iranica* Oláh, sp. nov.)