

On the Trichoptera of Western Europe: survey on Ptilocolepidae family, *Anisogamus* and *Sericostoma* genera

J. OLÁH¹ and G. VINÇON²

¹János Oláh, Tarján u. 28, H-4032 Debrecen, Hungary. Email: profolah@gmail.com.

<https://orcid.org/0000-0002-6137-0553>

³Gilles Vinçon, 55 Bd Joseph Vallier, F-38100 Grenoble, France. E-mail: gvincon@gmail.com

<https://orcid.org/0000-0003-4702-5136>

Abstract. In this paper on the Western European Trichoptera we survey the Ptilocolepidae family and the *Anisogamus* and *Sericostoma* genera as well as describe 12 new species: *Wormaldia arlua* sp. nov. (France), *Plectrocnemia estrela* sp. nov. (Portugal and Spain), *Rhyacophila fusunae* sp. nov. (Spain), *Ptilocolepus kover* sp. nov. (France and Spain), *Ptilocolepus sovan* sp. nov. (France and Spain), *Drusus demonta* sp. nov. (Italy), *D. roya* sp. nov. (France), *Anisogamus nahueli* sp. nov. (France), *A. sandreniko* sp. nov. (France), *Consorophylax vellach* sp. nov. (Austria), *Sericostoma unaequale* sp. nov. (Italy). Moreover, *Rhyacophila ildefonsa* sp. nov. (Spain), is distinguished from *R. relictata* McLachlan, 1879, and *Rhyacophila erkakanae* Sipahiler, 1993 stat. nov. is considered as a valid species different from *R. rupta* McLachlan, 1879. The male of *Chaetopteryx cantabrica* Oláh & Vinçon, 2022 is described for the first time. *Wormaldia maclachlani* Kimmins, 1953, *Tinodes jeekeli* Botosaneanu, 1980, *Lithax obscurus* (Hagen, 1859), *Crunoecia kempyi* Morton, 1901 are new for Italy, *Diplectrona magna* Mosely, 1930, *Drusus thibaulti* Decamps, 1972 are reported as new for Spain; *Chaetopteryx tomaszewski* Moretti, 1991, *Consorophylax kimera* (Oláh & Vinçon, 2021) are new for France.

Keywords. Incipient siblings, species complexes, new species, Western Europe.

INTRODUCTION

Applying the principles and procedures of fine phenomics, beside describing 12 new Western European caddisfly species, here we revise the small Ptilocolepidae family based on the lateral profile of the harpago, the second segment of the gonopod, overview the small *Anisogamus* genus with the description of a unique highly perturbed new lineage, as well as survey the *Sericostoma* genus by the divergences in the lateral profile of the spine-like pair of paraprocts. The particularly decorative small genus of *Sericostoma* was considered and treated as an unsettled taxon facing great difficulties in species delineation and identification. Suggested by the Atlas of European Trichoptera (Malicky 2004) many of us have identified species to “*personatum*” Kirby & Spence, 1826 or “*flavicornis*” Schneider, 1845 and set aside them for future revision. When starting this revision we were almost shocked to

realise that the confusion in their taxonomy was created almost artificially, by human hubris. We have found the paraproct, as the magic speciation trait, very applicable to establish the taxonomic position of each species. We are glad to declare that we do not need even to clear the genitalia to identify the *Sericostoma* species if we sacrifice and cut the left gonopod to expose the lateral profile of the left paraproct. This heavily sclerotized structure is very pronounced, easy to see, and as an adaptive, non-neutral speciation trait is very stable varying only in contact populations of the closely related sibling species like *Sericostoma personatum* and *S. pedemontanum*.

MATERIAL AND METHODS

In the present survey we have not sacrificed any gonopods; instead we have carefully cleared the genitalia of all specimens in 10 percent potassium hydroxid solution and carefully cleaned

by superfine tipped forceps for examination and drawings. All the collections of new specimens were realized by the second author.

Depositories. Canadian National Collection, Ottawa, Canada (CNC), Oláh Private Collection, Debrecen, Hungary, under national protection by the Hungarian Natural History Museum, Budapest (OPC).

TAXONOMY

Philopotamidae Stephens, 1829

Wormaldia ariega Oláh & Vinçon, 2021

Material examined. **France**, Ariège, below Crouzette Pass, nice spring, 760 m, 42.9137°N, 1.314°E, 15.IV.2022, leg. G. Vinçon (4 males, 1 female; OPC). **France**, Ariège, Videssos, Las Rougos, Pla de l'Izard, Mounicou tributary, spring and brook, 1220 m, 42.6949°N, 1.4497°E, 15.IV.2022, leg. G. Vinçon (3 males, OPC). **France**, Ariège, below Crouzette Pass, nice spring, 840 m, 42.9195°N, 1.3267°E, 15.IV.2022, leg. G. Vinçon (3 males, OPC). **France**, Ariège, below Crouzette Pass, nice spring, 850m, 42.9195°N, 1.3267°E, 9.X.2022, leg. Gilles Vinçon (5 males, OPC). **France**, Ariège, Videssos, Las Rougos, Pla de l'Izard, Mounicou tributary, spring and brook, 1220m, 42.6956°N, 1.451°E, 8.X.2022, leg. Gilles Vinçon (12 males, OPC).

Remarks. In the same locality and at the same collecting dates occurs *W. artillac* Sipahiler, 1999 together with *W. ariega*. We have found significant and outstanding differences between the examined type specimens of *W. ariega* and Sipahiler's drawings of *artillac*, especially in the lateral profile of the head of segment X, the speciation trait of the genus as well as in the endothecal spine pattern. In case of the head lateral profile the delineation is very easy, reliable and stable. Unfortunately the drawing of the endothecal spine pattern is highly subjective and very sensitive to the individually varying disposition of spines as a result of copulatory processes. Imagine a semicircularly curving small spine cluster of

three spines turning around freely in the three dimensional space and you see and draw it, not carefully enough, only from a not perfectly perpendicular angle. Unfortunately no type specimens of *W. artillac* were available for direct comparative study.

Wormaldia arlua sp. nov.

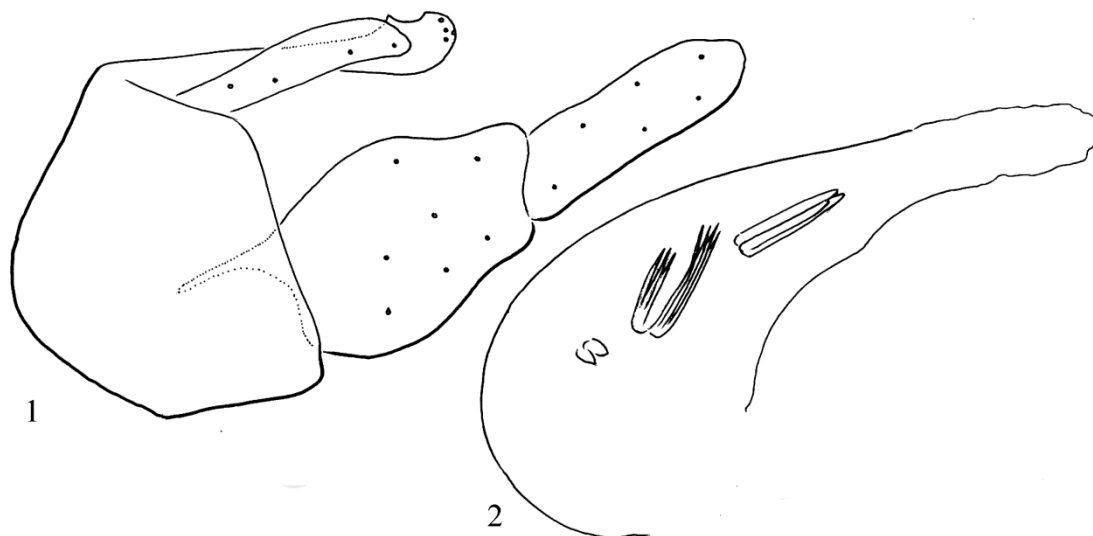
(Figures 1–2) (Photos 1, 2)

Material examined. Holotype: **France**, Ariège, path to Arlu Lake, nice spring, 1650m, 42.8142°N, 1.438°E, 9.X.2022, leg. Gilles Vinçon (1 male, OPC).

Diagnosis. This new species is rather unique integrating character states of pointed apex of harpago present in *Wormaldia charalambi* species group and concave dorsum of the head of segment X, a rather specialised, apomorphic character state in the *Wormaldia subnigra* clade of the *Wormaldia subnigra* species complex in the *Wormaldia triangulifera* species group. Moreover, it has a peculiar spine pattern in the endotheca of the phallic organ that differs from any species known presently in the *Wormaldia charalambi* group (*ameliae*, *charalambi*, *gardensis*, *kurta*, *mari-louae*, *yavuzi*). *Wormaldia arlua* sp. nov. is characterized by endothecal spine pattern of spine clusters. In contrary, all the species in the *charalambi* group have various numbers of single spines in the endotheca. We are unable to place our new species in any of the known species group and keep it among species with Incertae Sedis, with uncertain placement.

Description. Male (in alcohol). Medium-sized 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.

Male genitalia. Segment X characterized by narrow parallel-sided and narrowing apex in dorsal view, and by a large, upward directed dorsal pointed subapical process dominating in lateral view; the apex or the head of segment X typically with concave dorsum semicircular apicad; the ending is armed with sensory struc



Figures 1–2. *Wormaldia arlua* sp. nov. Holotype male: 1 = genitalia in left lateral view; 2 = gonopods in ventral view.

tures of *sensilla basiconica* (pegs) or *sensilla coeloconica* (pitted pegs) both on the very dorsal ending of the apex. Cerci slender with blunt apex, slightly downward directed in lateral view. Gonopods very produced coxopodite and harpago with almost equal length; harpagones long, stout, with tapering apex in lateral view. Phallic organ with eversible membranous endotheca containing four components of endothecal spines. Two almost touching basad, the shorter cluster composed of three slender spines and the slightly longer cluster composed of four slender spines. Third is composed of three adhering stout spines. The fourth component is a pair of very short and stout structures near to the phallosomal sclerite complex.

Character combination. (1) Dorso-subapical point of segment X is a pronounced pointed process, visible in lateral profile as the top formed by the apical right-angle of the very shallow dorsal concavity as well as by the concavity of the head dorsum. (2) Apex of segment X with concave dorsum; counted from the dorso subapical point it is elongated and its apical margin clearly semi-circular. (3) Apex of cerci elongated slightly ventrad directed. (4) Ventromesal projection of cerci absent. (5) Harpagones long, robust with slightly narrowing head. (6) Four components of endothecal spines present. (7) Two almost touching basad, the shorter composed of three slender

spines and the slightly longer cluster composed of four slender spines. (8) Third is composed of three adhering stout spines. (9) The fourth component is a pair of very short and stout structures.

Etymology. Coined from the name of the type locality, a noun in apposition.

***Wormaldia cantabrica* González & Botosaneanu, 1983**

Material examined. **Spain**, Asturias, road to the Puerto del Palo Allande, nice brook, 720 m, 43.2897N, 6.6431W, 22.IV.2022, leg. G. Vinçon (1 male, OPC). Spain, Asturias, Puerto del Palo Allande, brook and spring, 950 m, 43.2778°N, 6.6681°W up to 1000 m, 43.2764°N, 6.6725°W, 22.IV.2022, leg. G. Vinçon (1 male, OPC). Spain, Cantabria, above Yera, nice brook, 550–650 m, 43.1377°N, 3.7461°W, 20.IV.2022, leg. G. Vinçon (2 males, OPC). Spain, Asturias, Puerto de Tarna, brook and springs, from 1130m, 43.1095°N, 5.2188°W, to 1220m, 43.1073°N, 5.2159°W, 12.X.2022, leg. Gilles Vinçon (1 male, OPC). Spain, Cantabria, Puerto de la Palombera, brook, 1020m, 43.0847°N, 4.2515°W, 11.X.2022, leg. Gilles Vinçon (1 male, OPC). Spain, Cantabria, Puerto de la Palombera, nice brook and seeping rocks, 1010m, 43.0857°N, 4.2589°W,

11.X.2022, leg. Gilles Vinçon (3 males, OPC). Spain, Asturias, Somiedo, La Peral, brook and nice spring, from 1310m, 43.0409°N, 6.2519°W, to 1410m, 43.039°N, 6.2555°W, 13.X.2022, leg. Gilles Vinçon (5 males, OPC). Spain, Asturias, Puerto del Palo Allande, brook and spring, from 950m, 43.2778°N, 6.6681°W, up to 1000m, 43.2764°N, 6.6725°W, 13.X.2022, leg. Gilles Vinçon (1 male, OPC). **Spain**, Cantabria, Puerto del Ponton, Fuente del Infierno, brook and spring, 1260m, 43.1023°N, 5.0303°W, 12.X.2022, leg. G. Vinçon (2 males, OPC).

***Wormaldia cianficconiae* Neu, 2017**

Material examined. **Italy**, Marches, E. Purello, nice spring and two brooks, 530 m, 43.32°N, 12.7733°E, 20.V.2022, leg. G. Vinçon (1 male, OPC).

***Wormaldia copiosa* (McLachlan, 1868)**

Material examined. **Switzerland**, Vaud, Les Fontannets de la Mothe, very nice spring, 600 m, 46.8195°N, 6.567°E, 10.III.2022, leg. G. Vinçon (6 males, OPC). Switzerland, Jura Massif, Soubey, Bief de la Côte au Bouvier, 600–650 m, 47.3°N, 7.06°E, 13.III.2022, leg. G. Vinçon (1 male, OPC).

***Wormaldia echinata* Tobias, 1995**

Material examined. **France**, Alpes-Maritimes, Bevera Valley, spring and brook, 1400-1500 m, 43.981N, 7.425E, 6.I.2022, leg. G. Vinçon (1 male, OPC).

***Wormaldia gattolliati* Malicky & Graf, 2017**

Material examined. **Italy**, Emilie-Romagne, N.E. Passo Lagastrello, nice spring, 1110 m, 44.3562°N, 10.156°E, 17.V.2022, leg. G. Vinçon (2 males, OPC). Italy, Emilie-Romagne, W. Rigoso, road to Prato Spilla, nice brook and spring, 1220 m, 44.3678°N, 10.127°E, 16.V.2022, leg. G. Vinçon (1 male, OPC).

***Wormaldia ligurica* Oláh & Vinçon, 2022**

Material examined. **Italy**, Ligurian Apennines, above Rocca d'Aveto, nice brook and spring, 1400 m, 44.555°N, 9.4767°E, 15.V.2022, leg. G. Vinçon (1 male, OPC).

***Wormaldia maclachlani* Kimmins, 1953**

Material examined. **Italy**, Piemont, Pennines Alps, Civiasco, spring below water catchment, 770 m, 45.8104N, 8.2973E, 27.V.2022, leg. Gilles Vinçon (1 male, OPC).

Remark. New for the Italian Fauna.

***Wormaldia morettii* Vigano, 1974**

Material examined. **Italy**, Marches, Parco Nazionale dei Monti Sibillini, above Casali, nice brook and spring, 1080 m, 42.9506°N, 13.177°E, 18.V.2022, leg. G. Vinçon (2 males, OPC).

***Wormaldia moselyi* Kimmins, 1953**

Material examined. **France**, Pyrénées-Atlantiques, Marie-Blanque Pass, nice spring, 910 m, 43.0697°N, 0.5213°W, 18.IV.2022, leg. G. Vinçon (1 male, OPC).

***Wormaldia occipitalis* (Pictet, 1834)**

Material examined. **France**, Pyrénées-Orientales, above Sorède, La Farga, nice brook, 450 m, 42.4979°N, 2.9572°E, 30.IV.2022, leg. G. Vinçon (3 males, OPC).

***Wormaldia subterranea* Radovanovic, 1932**

Material examined. **Switzerland**, Vaud, Les Fontannets de la Mothe, very nice spring, 600 m, 46.8195°N, 6.567°E, 10.III.2022, leg. G. Vinçon (1 male, OPC). Switzerland, Jura Massif, Soubey, Bief de la Côte au Bouvier, 600 – 650 m, 47.3°N, 7.06°E, 13.III.2022, leg. G. Vinçon (5 males, OPC).

***Wormaldia triangulifera* McLachlan, 1878**

Material examined. **France**, Pyrénées-Orientales, above Sorède, La Farga, nice brook, 450 m, 42.4979°N, 2.9572°E, 30.IV.2022, leg. G. Vinçon (12 males, OPC). **France**, Haute-Garonne, Bagnère-de-Luchon, Pique Valley above Hospice de France, nice spring, 1400m, 42.7195°N, 0.6564°E, 9.X.2022, leg. Gilles Vinçon (1 male, OPC).

***Wormaldia vargai* Malicky, 1981**

Material examined. **Slovenia**, Julian Alps, S. Vrsic Pass, Minarica trib., nice spring, 1300 m, 46.4113N, 13.7515E, 21.V.2022, leg. G. Vinçon (2 males, 2 females; OPC). **Slovenia**, N.E. Bovec, nice seeping rocks, 430 m, 46.3399°N, 13.5745°E, 21.V.2022, leg. G. Vinçon (2 males, 3 females; OPC).

***Philopotamus ludificatus* McLachlan, 1878**

Material examined. **France**, Drôme, Vercors, Tourtre, Adouin, 760 m, 45.0035°N, 5.4563°E, 11.III.2022, leg. G. Vinçon (6 males, 4 females; OPC). **Italy**, Atesine Alps, N. Maranza, spring and brook, 1590 m, 46.8345°N, 11.6479°E, 25.V.2022, leg. G. Vinçon (2 males, 3 females; OPC). **Italy**, Atesine Alps, N. Maranza, big brook near Hexenhütte, 1750 m, 46.8562°N, 11.6637°E, 25.V.2022, leg. G. Vinçon (4 males, 3 females; OPC). **Italy**, Emilie-Romagne, above Prato Spilla, from 1580 m, 44.352°N, 10.1001°E to 1630 m, 44.35°N, 10.1°E, 16.V.2022, leg. G. Vinçon (4 males, 3 females; OPC).

***Philopotamus montanus* Donovan, 1813**

Material examined. **France**, Hautes-Pyrénées, N.W. Aspin Pass, 1450 m, nice brook, 42.9454°N, 0.3202°E, 17.IV.2022, leg. G. Vinçon (8 males, 3 females; OPC). **Spain**, Val d'Aran, Portillon Pass, brook, 1260 m, 42.7645°N, 0.66°E, 17.IV.2022, leg. G. Vinçon (6 males, 2 females; OPC). **Spain**, Asturias, Puerto de Leitariegos, Brañas de Arriba, nice spring, 1400 m, 43.0128°N, 6.4451°W, 21.IV.2022, leg. G. Vinçon (8 males, 3 females; OPC). **Spain**, Can-

tabria, above Yera, nice brook, 550–650 m, 43.1377°N, 3.7461°W, 20.IV.2022, leg. G. Vinçon (1 male, OPC).

Psychomyiidae Walker, 1852

***Tinodes consiglioi* Botosaneanu, 1980**

Material examined. **Italy**, Marches, Parco Nazionale dei Monti Sibillini, nice torrent at Ussita, 730 m, 42.943°N, 13.138°E, 18.V.2022, leg. G. Vinçon (4 males, 3 females; OPC). **Italy**, Molise, Castel San Vincenzo, Sorgente Acquaruolo, 470 m, 41.6594°N, 14.0783°E, 19.V.2022, leg. G. Vinçon (1 male, OPC). **Italy**, Molise, Castel San Vincenzo, River Volturmo, 530 m, 41.654°N, 14.077°E, 19.V.2022, leg. G. Vinçon (7 males, 6 females; OPC).

Remark. It is considered as a subspecies of *T. dives* in Lodovici & Valle (2020).

***Tinodes jeekeli* Botosaneanu, 1980**

Material examined. **Italy**, Lombardian Pre-Alps, Bergamo, Passo San Marco, S. slope, nice spring, 1730 m, 46.0381°N, 9.6358°E, 26.V.2022, leg. G. Vinçon (6 males, 2 females; OPC). **Slovenia**, Kranj, Pohorje Mountains, Travertine springs (limestone substratum), Kokra trib., 850 m, 46.3993°N, 14.4698°E, 22.V.2022, leg. G. Vinçon (8 males, 5 females; OPC).

Remark. This species is new for the Italian Fauna.

***Tinodes rostocki* McLachlan, 1878**

Material examined. **Spain**, Cantabria, Peñarubia, E Linares, resurgence, 420 m, 43.2554°N, 4.5741°W, 20.IV.2022, leg. G. Vinçon (4 males, 3 females; OPC). **Slovenia**, near the Italian border, Julian Pre-Alps, below Livek, spring and brook, 600 m, 46.2123°N, 13.5939°E, 21.V.2022, leg. G. Vinçon (1 male, OPC). **Slovenia**, N.E. Bovec, nice seeping rocks, 430 m, 46.3399°N, 13.5745°E, 21.V.2022, leg. G. Vinçon (5 males, 3 females; OPC).

Polycentropodidae Ulmer, 1903

***Plectrocnemia estrela* sp. nov.**

(Figures 3–5) (Photos 3, 4)

Material examined. Holotype: **Portugal**, Serra da Estrela Massif, brooklet, on the snow, 1450–1480 m, 40.3802°N, 7.6457°W, 23.IV.2022, leg. G. Vinçon (1 male, OPC). Paratype: **Spain**, Asturias, Puerto del Palo Allande, brook and spring, from 950m, 43.2778°N, 6.6681°W, up to 1000m, 43.2764°N, 6.6725°W, 13.X.2022, leg. Gilles Vinçon (1 male, OPC).

Diagnosis. A sibling species, close to *Plectrocnemia laetabilis* McLachlan, 1880 described from the Pyrenees (Col de Menté, Haute Garonne). This species from the Pyrenees is distinguished in the original species description by the very short, broad, and deeply excised inferior appendages (gonopods). Its ventral shape is characterized by pronounced apicomeresal lobe. *Plectrocnemia estrela* sp. nov. differs from *laetabilis* by the almost perfectly regular quadrangular shape of the gonopods in ventral view as well as by the more elongated and differently patterned

ventral profile of the dorsal and ventral arms of the paraproct.

Description. Medium-sized *Plectrocnemia* species of brownish body and wing colour with forewing length of 10 mm. Forewing densely covered with recumbent setae.

Male genitalia. In lateral view sternite IX subtriangular, dominating over the entire genitalia articulating and holding the periphallial organs of cerci-paraproct fused complex and the gonopods. Tergite IX small vertically elongated giving support to the membranous segment X. Cerci large foliiform. Paraproct bipartite vertically elongated, its dorsal arms form part of the phallocrypt giving ventral support for the phallic organ, its ventral arm directed downward deep and densely covered with short stout peg-like setae. Gonopods regular quadrangular in ventral view without any apicomeresal lobes. Phallic organ composed, badly discernible without dissection, supplied with a pair of parameres corrugated from middle.

Etymology. Coined from the name of locus typicus, a noun in apposition.



Figs 3-5. *Plectrocnemia estrela* sp. nov. Holotype male: 3 = genitalia in left lateral view; 4 = gonopods in ventral view; 5 = phallic organ in left lateral view.

***Plectrocnemia praestans* McLachlan, 1884**

Material examined. **France**, Alpes-Maritimes, Caïros Valley, Fromagine spring, 1500m, 44.0208°N, 7.4317°E, 17.VII.2022, leg. Gilles Vinçon (1 male, OPC). **Italy**, Piémont, brook and spring tributary of Stura di Demonte, above Villaggio Primavera, 1530 m, 44.373°N, 6.9755°E, 14.V.2022, leg. Gilles Vinçon (1 male, OPC).

***Plectrocnemia scruposa* McLachlan, 1880**

Material examined. **France**, Pyrénées-Atlantiques, Osse-en-Aspe, Labays Pass, Oueils d'Is-saux, nice resurgence, 680m, 43.00655°N, 0.691°W, 18.IV.2022, leg. G. Vinçon (1 male, OPC).

***Polycentropus flavomaculatus* Pictet, 1834**

Material examined. **Spain**, Cantabria, Vega de Pas, brook and cascade, arroyo Enverao, 900m, 43.1208°N, 3.7133°W, 11.X.2022, leg. Gilles Vinçon (1 male, OPC).

Hydropsychidae Curtis, 1835

Diplectroninae Ulmer, 1951

***Diplectrona atra* McLachlan, 1878**

Material examined. **Italy**, Lombardian Pre-Alps, Bergamo, Passo San Marco, S. slope, nice spring, 1730 m, 46.0381N, 9.6358E, 26.V.2022, leg. G. Vinçon (6 males, 2 females; OPC).

***Diplectrona magna* Mosely, 1930**

Material examined. **Spain**, Asturias, North Pola de Allande, nice springs, 750 m, 43.2862°N, 6.6136°W, 22.IV.2022, leg. G. Vinçon (1 male, OPC).

Remark. This species is probably new for the Iberian Fauna.

Rhyacophilidae Stephens, 1836

***Rhyacophila adjuncta* McLachlan, 1884**

Material examined. **Spain**, Castilla y Leon, Sierra de Candelario, Rio Becedillas at Becedas,

1110 m, 40.4013N, 5.6371W, 23.IV.2022, leg. G. Vinçon (2 males, OPC). **Spain**, Communauté de Madrid, Sierra de Guadarrama, South-West Rascafria, nice brook, 1450 m, 40.8361N, 3.9131W, 26.IV.2022, leg. G. Vinçon (1 male, OPC).

***Rhyacophila denticulata* McLachlan, 1879**

Material examined. **France**, Ariège, Videssos, Videssos River at Mounicou, 1100 m, nice river with abundant aquatic vegetation, 42.7077°N, 1.4503°E, 15.IV.2022, leg. G. Vinçon (1 male, 2 females; OPC). **France**, Ariège, Videssos, Videssos River at Mounicou, nice river with abundant aquatic vegetation, 1110 m, 42.70775°N, 1.4503°E, 8.X.2022, leg. Gilles Vinçon (1 male, OPC).

***Rhyacophila eatoni* McLachlan, 1879**

Material examined. **France**, Pyrénées-Atlantiques, Osse-en-Aspe, Labays Pass, Oueils d'Is-saux, nice resurgence, 680 m, 43.00655°N, 0.6913°W, 18.IV.2022, leg. G. Vinçon (9 males, OPC). **France**, Pyrénées-Atlantiques, Iraty, nice resurgence, 1100 m, 43.0451°N, 1.0546°W, 19.IV.2022, leg. G. Vinçon (2 males, OPC). **France**, Ariège, Videssos, above Soulcem Lake, Gardelle brook, 1820 m, 42.657°N, 1.439°E, 15.IV.2022, leg. G. Vinçon (1 male, OPC). **France**, Pyrénées-Atlantiques, Eaux-Bonnes, Iscoo spring, nice resurgence, 820 m, 42.969°N, 0.3806°W, 18.IV.2022, leg. G. Vinçon (4 males, 2 females; OPC). **France**, Pyrénées-Atlantiques, Marie-Blanche Pass, nice brook, 1050 m, 43.0643°N, 0.5033°W, 18.IV.2022, leg. G. Vinçon (1 male, OPC). **France**, Haute-Garonne, Bagnère-de-Luchon, Pique Valley above Hospice de France, nice spring, 1400m, 42.7195°N, 0.6564°E, 9.X.2022, leg. Gilles Vinçon (2 males, OPC). **France**, Pyrénées-Orientales, Canigou Massif, above Py, Rotja tributary, 1530m, nice brook, 42.4838°N, 2.3245°E, 7.X.2022, leg. G. Vinçon (1 male, OPC). **Spain**, Val d'Aran, Artiga de Lin, nice spring and brook, 1150 m, 42.7073°N, 0.7138°E, 17.IV.2022, leg. G. Vinçon (2 males, OPC). **Spain**, Cantabria, above Yera, nice brook, 550-650 m, 43.1377°N, 3.7461°W, 20.IV.2022, leg.

G. Vinçon (1 male, OPC). Spain, Navarra, Puerto de Ibañeta, Valcarlos, brook and spring, Luzaide tributary, 890 m, 43.0309°N, 1.3435°W, 19.IV.2022, leg. G. Vinçon (2 males, 1 female; OPC). Spain, Navarra, Puerto de Ibañeta, Valcarlos, brook, Luzaide tributary, 620m, 43.0446°N, 1.3266°W, 10.X.2022, leg. Gilles Vinçon (1 male, OPC). France, Pyrénées-Orientales, Canigou Massif, Prats-de-Mollo-la-Preste, brook and spring, 1740m, 42.4459°N, 2.4155°E, 15.X.2022, leg. Gilles Vinçon (2 males, 2 females; OPC). Spain, Cantabria, Puerto de la Palombera, nice brook and seeping rocks, 1010m, 43.0857°N, 4.2589°W, 11.X.2022, leg. Gilles Vinçon (7 males, OPC). Spain, Navarra, Puerto de Ibañeta, Valcarlos, brook, Luzaide tributary, 880-1000m, 43.0309°N, 1.3435°W, 10.X.2022, leg. G. Vinçon (3 males, 3 females; OPC).

***Rhyacophila erkakanae* Sipahiler, 1993 stat. nov.**

Rhyacophila rupta erkakanae Sipahiler, 1993:46–47.

Material examined. France, Pyrénées-Orientales, Canigou Massif, above Py, Rotja tributary, 1530m, nice brook, 42.4838°N, 2.3245°E, 7.X.2022, leg. G. Vinçon (1 male, OPC).

Remarks. In the phylogenetic species concept subspecies and races are taken out from sciences (Oláh *et al.* 2018). Moreover, the morphological divergences between *Rhyacophila rupta* McLachlan, 1879 and *Rhyacophila erkakanae* Sipahiler, 1993 **stat. nov.** are very great both in the phallic and the periphallid structures.

***Rhyacophila evoluta* McLachlan, 1879**

Material examined. France, Pyrénées-Orientales, Puigmal Massif, Ribera d'Err, 1900–2200 m, 42.3855°N, 2.0926°E, 14.IV.2022, leg. G. Vinçon (1 male, OPC). France, Pyrénées-Orientales, below Pas de la Case, rec del Baladrar torrent and lateral springs, 1800-1900 m, 42.556°N, 1.768°E, 14.IV.2022, leg. G. Vinçon (9 males, OPC). France, Ariège, Videssos, Videssos River

at Mounicou, nice river with abundant aquatic vegetation, 1110 m, 42.70775°N, 1.4503°E, 8.X.2022, leg. Gilles Vinçon (1 male, OPC).

***Rhyacophila fasciata* Hagen, 1859**

Material examined. Slovenia, N.E. Bovec, nice seeping rocks, 430 m, 46.3399N, 13.5745E, 21.V.2022, leg. G. Vinçon (2 males, OPC).

***Rhyacophila fusunae* sp. nov.**

(Figures 6–8) (Photo 5)

Material examined. Holotype: Spain, Cantabria, above Yera, nice brook, 550–650 m, 43.137°N, 3.7461°W, 20.IV.2022, leg. G. Vinçon (1 male, OPC).

Diagnosis. This new species is close as a sibling to *Rhyacophila joani* Sipahiler, 2000; which was described from nearby habitat and related closely to the Pyrenean species *Rhyacophila rupta* McLachlan, 1879. *Rhyacophila fusunae* sp. nov. differs from *R. joani* by the differently shaped mesoapical dorsal process of segment IX both in the dorsal and lateral views; by the apically strait truncated dorsal profile of the cerci; by the harpago having apicodorsal pointed process turning mesad, not dorsad; by the longer paramere and by the ventral view of the aedeagus with lateral wings less pronounced.

Description. Dorsal apicomeral lobe of segment IX as long as cerci, little longer than broad in dorsal view, digitiform in lateral view. Cerci broad plate-like, almost straight truncated apicad. Segment X with downward curving hook-like apex in lateral view. Epiproct (anal sclerites), as usual, heavily sclerotized; slightly bilobed both in lateral and dorsal views. Paraproct (U-shaped tergal straps) short and high in lateral view. Harpago, the second segment of gonopod, with apicodorsal lobe pointed, slightly mesad turned. Phallic organ has very stout pair of parameres with two terminal unequal spines directed mesad; aedeagus narrowing apicad.



Figures 6–8. *Rhyacophila fusunae* sp. nov. Holotype male: 6 = genitalia in left lateral view; 7 = apicodorsal process of segment IX and the cerci in dorsal view; 8 = phallic organ in left lateral view.

Etymology. The name of this species is dedicated to Füsün Sipahiler who has described its sibling relative.

***Rhyacophila hirticornis* McLachlan, 1879**

Material examined. **Italy**, Julian Pre-Alps, Cepletischis, spring and brook, 580 m, 46.1795° N, 13.5696°E, 21.V.2022, leg. G. Vinçon (1 male, OPC). **Slovenia**, Julian Alps, E. Srednji Vrh, nice spring, 1060 m, 46.4952°N, 13.8518°E, 23.V.2022, leg. G. Vinçon (1 male, OPC). Slovenia, Kranj, Pohorje Mountains, Travertine springs (limestone substratum), Kokra tributary, 850 m, 46.3993°N, 14.4698°E, 22.V.2022, leg. G. Vinçon (1 male, OPC).

***Rhyacophila intermedia* McLachlan, 1868**

Material examined. **France**, Isère, Taillefer Massif, below Brouffier lake, Guiliman, 1990 m, 45.0354°N, 5.884°E, 6.VIII.2022, leg. G. Vinçon (2 males, 1 female, OPC). France, Pyrénées-Orientales, Puigmal Massif, Ribera d'Err, lateral spring, 2140m, 42.3855°N, 2.0926°E, 7.X.2022, leg. Gilles Vinçon (1 male, OPC).

***Rhyacophila laevis* Pictet, 1834**

Material examined. **Italy**, Julian Pre-Alps, road to Cepletischis, nice springs and seeping rocks, 340m, 46.1701°N, 13.5581°E and 46.1703° N, 13.5575°E, 21.V.2022, leg. G. Vinçon (1 male, OPC). **Slovenia**, near Italian border, Julian Pre-Alps, below Livek, spring and brook, 600 m, 46.2123°N, 13.5939°E, 21.V.2022, leg. G. Vinçon (5 males, 1 female; OPC).

***Rhyacophila laufferi* Navas, 1918**

Material examined. **Spain**, Asturias, Puerto de Leitariegos, Brañas de Arriba, nice spring, 1400 m, 43.0128N, 6.4451W, 21.IV.2022, leg. G. Vinçon (1 male, OPC).

***Rhyacophila martynovi* Mosely, 1930**

Material examined. **France**, Pyrénées-Atlantiques, Osse-en-Aspe, Labays Pass, Oueils d'Issaux, nice resurgence, 680 m, 43.00655°N, 0.6913°W, 18.IV.2022, leg. G. Vinçon (2 males, OPC). France, Pyrénées-Atlantiques, Osse-en-Aspe, Oueils d'Issaux, nice resurgence, 720m,

43.0045°N, 0.693°W, 10.X.2022, leg. Gilles Vinçon (1 male, OPC). **Spain**, Navarra, Puerto de Ibañeta, Valcarlos, brook, Luzaide tributary, 620m, 43.0446°N, 1.3266°W, 10.X.2022, leg. Gilles Vinçon (1 male, OPC). **Spain**, Asturias, Puerto de Tarna, brook and springs, from 1130m, 43.1095°N, 5.2188°W, to 1220m, 43.1073°N, 5.2159°W, 12.X.2022, leg. Gilles Vinçon (1 male, OPC). **Spain**, Asturias, Somiedo, La Peral, brook and nice spring, from 1310m, 43.0409°N, 6.2519°W, to 1410m, 43.039°N, 6.2555°W, 13.X.2022, leg. Gilles Vinçon (1 male, OPC). **Spain**, Navarra, Puerto de Ibañeta, Valcarlos, brook, Luzaide tributary, 880-1000m, 43.0309°N, 1.3435°W, 10.X.2022, leg. G. Vinçon (6 males, 7 females; OPC). **Spain**, Cantabria, Puerto del Ponton, Fuente del Infierno, brook and spring, 1260m, 43.1023°N, 5.0303°W, 12.X.2022, leg. G. Vinçon (8 males, 3 females; OPC).

***Rhyacophila melpomene* Malicky, 1976**

Material examined. **Spain**, Cantabria, Puerto del Ponton, Fuente del Infierno, brook and spring, 1260m, 43.1023°N, 5.0303°W, 12.X.2022, leg. G. Vinçon (1 male, OPC).

***Rhyacophila meyeri* McLachlan, 1879**

Material examined. **Italy**, Julian Alps, S. Fusine, nice spring below the water catchment, 840 m, 46.4922°N, 13.6689°E and two nice springs at 910 m, 46.4857°N, 13.6735°E, 23.V.2022, leg. G. Vinçon (4 males, OPC). **Italy**, Julian Alps, W. Sella Nevea, brook, 1040 m, 46.3897°N, 13.4693°E, 24.05.2022, leg. G. Vinçon (2 males, OPC). **Slovenia**, Julian Alps, N. Vrsic Pass, Pišnica trib., nice spring, 1390 m, 46.4399°N, 13.7538°E, 22.V.2022, leg. G. Vinçon (6 males, OPC).

***Rhyacophila pongensis* Sipahiler, 2000**

Material examined. **Spain**, Asturias, Somiedo, La Peral, brook and nice spring, from 1310m, 43.0409°N, 6.2519°W, to 1410m, 43.039°N, 6.2555°W, 13.X.2022, leg. Gilles Vinçon (1 male, OPC).

***Rhyacophila producta* McLachlan, 1879**

Material examined. **Italy**, Julian Alps, S. Fusine, nice spring below the water catchment, 840 m, 46.4922°N, 13.6689°E and two nice springs at 910 m, 46.4857°N, 13.6735°E, 23.V.2022, leg. G. Vinçon (2 males, 6 females; OPC). **Slovenia**, Julian Alps, N. Vrsic Pass, Pišnica trib., nice spring, 1390 m, 46.4399°N, 13.7538°E, 22.V.2022, leg. G. Vinçon (2 males, 1 female; OPC).

***Rhyacophila rupta* McLachlan, 1879**

Material examined. **France**, Ariège, above Biert, in direction of the Crouzette Pass, nice brook, 670 m, 42.9009°N, 1.3131°E, 15.IV.2022, leg. G. Vinçon (2 males, OPC). **France**, Haute-Garonne, Bagnère-de-Luchon, Pique Valley above Hospice de France, nice spring, 1400m, 42.7195°N, 0.6564°E, 9.X.2022, leg. Gilles Vinçon (2 males, OPC). **France**, Ariège, path to Arlu Lake, nice spring, 1650m, 42.8142°N, 1.438°E, 9.X.2022, leg. Gilles Vinçon (2 males, OPC).

***Rhyacophila rectispina* McLachlan, 1884**

Material examined. **Italy**, Piedmont, Pennines Alps, high Sesia Valley, above Sant'Antonio, big spring below Lago Nero, 2630 m, 45.814°N, 7.88°E, 26.V.2022, leg. G. Vinçon (1 male, OPC).

***Rhyacophila relictata* species complex**

Having complex phallic organ, vertical segment X and cerci present this small complex belongs to the *Rhyacophila vulgaris* branch. Segment IX abbreviated ventrad and supplied with a strong dorsal lobe, a character state relating it to the *R. vulgaris* species group. Close to *R. nubila* and *R. dorsalis* complexes. Two species belong to this complex: *Rhyacophila ildefonsa* sp. nov. and *R. relictata*.

***Rhyacophila ildefonsa* sp. nov.**

Rhyacophila relictata McLachlan, 1879: Schmid 1970: 121. Identified and redrawn as *Rhyacophila relictata* McLachlan, 1879. Misidentification.

Rhyacophila relict McLachlan, 1879: Malicky, 1983: 7. Schmid's drawings accepted as *Rhyacophila relict* McLachlan, 1879. Misidentification.

Rhyacophila relict McLachlan, 1879: Malicky, 2004: 9. Schmid's drawings accepted as *Rhyacophila relict* McLachlan, 1879. Misidentification.

Material. Holotype: **Spain**, San Ildefonso, Sierra de Guadarrama, (Schmid 1970: documented in figure explanation, table VII, figures 16–18. Deposited as *Rhyacophila relict* McLachlan, 1879 in the Canadian National Collection, Ottawa)

Diagnosis. The new species is close to *Rhyacophila relict* McLachlan, 1879, forming together a small species complex, but differs by the short, not long, tapering, not parallel-sided, dorsal process of segment IX; it is much longer than the fused cerci. The fused cerci are convex apicad in dorsal view, not concave. The harpago with longer apicoventral narrowing structure. The pair of the ventral arm of aedeagus rounded apicad, not truncated.

Description. Dorsal process of segment IX elongated parallel-sided broad plate with truncated apex only slightly longer than cerci. Cerci fused to segment X forming together slightly convex apical margin in dorsal view. Paraproct (apical band of Schmid) well-developed, membranous, slightly sclerotized. Ventral arm of segment X pronounced, less sclerotized and attached to the pair of short heavily sclerotized epiprocts (anal sclerite of Schmid). The second segment of gonopod, the harpago with elongated ventral half. Phallic organ composed of a pair of stout spine-like paramere with mesad directed apical half and the complex of aedeagus; ventral arms of aedeagus rounded apicad.

Etymology. Coined from the name of locus typicus, as a noun in apposition

***Rhyacophila relict* McLachlan, 1879**

Rhyacophila relict McLachlan, 1879:442. Pyrenees (River Névez, near Gan and Rénénaq, Basses Pyrénées, 17th June, Eaton, 2♂, 1♀). „In the ♂ the

dorsal process is longer than the lateral lobe, narrow, gradually narrowing from base to apex, which is truncate (not dilated).”

Material examined. **France**, Pyrenees, River system Nivelles, 12–18. VII. 1986, singled leg. J. Oláh (6 males, 1 female; OPC).

***Rhyacophila stigmatica* Kolenati, 1859**

Material examined. **Italy**, Lombardian Pre-Alps, Bergamo, Passo San Marco, S. slope, nice spring, 1730 m, 46.0381°N, 9.6358°E, 26.V.2022, leg. G. Vinçon (2 males, OPC).

***Rhyacophila tristis* Pictet, 1834**

Material examined. **France**, Isère, Taillefer Massif, below Brouffier lake, Guiliman, 1990 m, 45.0354°N, 5.884°E, 6.VIII.2022, leg. G. Vinçon (2 males, 2 females, OPC). **Italy**, Marches, below Monte Acuto, Fonte Acera, 1190 m, 43.4628°N, 12.6944°E, 20.05.2022, leg. G. Vinçon (1 male, OPC). **Italy**, Lombardian Pre-Alps, Bergamo, Passo San Marco, S. slope, nice spring, 1730 m, 46.0381°N, 9.635°E, 26.V.2022, leg. G. Vinçon (6 males, 2 females; OPC). **Portugal**, Serra da Estrela Massif, above Loriga, torrent, 850 m, 40.333°N, 7.6869°W, 23.IV.2022, leg. G. Vinçon (1 male, OPC). **Portugal**, Serra da Estrela Massif, above Loriga, nice brooklets, 940 m, 40.3381°N, 7.7074°W, 23.IV.2022, leg. G. Vinçon (2 males, OPC). **Spain**, Asturias, Puerto de Tarna, nice spring with abundant aquatic vegetation, 980 m, 43.1156°N, 5.2395°W, 21.IV.2022, leg. G. Vinçon (1 male, OPC). **Spain**, Asturias, Puerto de Leitariagos, Brañas de Arriba, nice spring, 1400 m, 43.0128°N, 6.4451°W, 21.IV.2022, leg. G. Vinçon (1 male, OPC). **Spain**, Galicia, North-East Manzaneda, brook, 670 m, 42.3055°N, 7.2305°W, 22.IV.2022, , leg. G. Vinçon (2 males, 1 female; OPC). **Spain**, Galicia, West Ponte de Neira, nice springs tributaries of the Neira River, 550 m, 42.9185°N, 7.2147°W, 22.IV.2022, leg. G. Vinçon (2 males, OPC).

***Rhyacophila vandeli* Despax, 1933**

Material examined. **France**, Pyrénées-Orientales, Canigou Massif, Prats-de-Mollo-la-Preste,

nice brook and spring, 1860 m, 42.4523°N, 2.4102°E, 30.IV.2022, leg. G. Vinçon (21 males, 3 females; OPC). France, Pyrénées-Orientales, Canigou Massif, Prats-de-Mollo-la-Preste, brook and springs, 1910 m, 42.4603°N, 2.4161°E, 30.IV.2022, leg. G. Vinçon (1 male, OPC). France, Pyrénées-Orientales, Canigou Massif, Prats-de-Mollo-la-Preste, 2 brooks and 1 nice spring, 1630 m, 42.4348°N, 2.394°E, 30.IV.2022, leg. G. Vinçon (4 males, 2 females; OPC). France, Pyrénées-Orientales, Canigou Massif, Prats-de-Mollo-la-Preste, Jourdonna brook and spring, 1740 m, 42.4459°N, 2.4155°E, 30.IV.2022, leg. G. Vinçon (6 males, 3 females; OPC). **Spain**, Catalogna, tributaries of Riu de Carboner: spring, 1980 m, 42.4063°N, 2.324°E, and torrent dels Forquets, 2020–2050 m, 42.4118°N, 2.3171°E, 30.IV.2022, leg. G. Vinçon (5 males, 1 female; OPC).

***Rhyacophila vulgaris* Pictet, 1834**

Material examined. **France**, Drôme, South Vercors Massif, Archiane, nice big resurgence, 770 m, 44.7461°N, 5.5064°E, 11.III.2022, leg. G. Vinçon (3 males, OPC). **Italy**, Atesine Alps, N. Maranza, big brook near Hexenhütte, 1750 m, 46.8562°N, 11.6637°E, 25.V.2022, leg. G. Vinçon (2 males, OPC).

Glossosomatidae Wallengren, 1891

***Glossosoma privatum* McLachlan, 1884**

Material examined. **Spain**, Castilla y Leon, Sierra de Gredos, Garganta de Navamediana, 1130 m, 40.3156°N, 5.4159°W, 24.IV.2022, leg. G. Vinçon (2 males, OPC). Spain, Cantabria, Rio Saja, Mina da Lapiz, 520 m, 2 springs and the river, 43.1232°N, 4.2961°W, 20.IV.2022, leg. G. Vinçon (4 males, OPC).

***Agapetus arvernensis* Malicky, 1980**

Material examined. **France**, Ariège, path to Arlu Lake, nice spring, 1650m, 42.8142°N,

1.438°E, 9.X.2022, leg. Gilles Vinçon (1 male, OPC).

***Agapetus diversus* McLachlan, 1884**

Material examined. **Portugal**, Serra da Estrela Massif, above Loriga, torrent, 850 m, 40.333°N, 7.6869°W, 23.IV.2022, leg. G. Vinçon (1 male, OPC).

***Agapetus dubitans* McLachlan, 1879**

Material examined. France, Alpes-Maritimes, Caïros Valley, Fromagine spring, 1500m, 44.0208°N, 7.4317°E, 17.VII.2022, leg. Gilles Vinçon (1 male, OPC).

***Agapetus fuscipes* Curtis, 1834**

Material examined. **France**, Pyrénées-Orientales, above Sorède, La Farga, nice brook, 450 m, 42.4979°N, 2.9572°E, 30.IV.2022, leg. G. Vinçon (1 male, OPC).

***Agapetus insons* McLachlan, 1879**

Material examined. **France**, Pyrénées-Atlantiques, Osse-en-Aspe, Labays Pass, Oueils d'Is-saux, nice resurgence, 680 m, 43.00655°N, 0.6913°W, 18.IV.2022, leg. G. Vinçon (5 males, OPC). France, Pyrénées-Orientales, Canigou Massif, Prats-de-Mollo-la-Preste, nice brook and spring, 1860 m, 42.4523°N, 2.4102°E, 30.IV.2022, leg. G. Vinçon (2 males, OPC). France, Haute-Garonne, Bagnère-de-Luchon, Pique Valley above Hospice de France, nice spring, 1400m, 42.7195°N, 0.6564°E, 9.X.2022, leg. Gilles Vinçon (14 males, OPC). **Spain**, Val d'Aran, Artiga de Lin, nice spring and brook, 1150 m, 42.7073°N, 0.7138°E, 17.IV.2022, leg. G. Vinçon (1 male, OPC).

***Agapetus krawanyi* Ulmer, 1938**

Material examined. **Slovenia**, near Italian border, Julian Pre-Alps, below Livek, spring and

brook, 600 m, 46.2123°N, 13.5939°E, 21.V.2022, leg. G. Vinçon (1 male, OPC).

***Agapetus lusitanicus* (Malicky, 1980)**

Material examined. **Spain**, Asturias, Puerto de Tarna, nice spring with abundant aquatic vegetation, 980 m, 43.1156N, 5.2395W, 21.IV.2022, leg. G. Vinçon (10 males, 3 females, OPC). Spain, Asturias, road to the Puerto del Palo Allande, nice brook, 720 m, 43.2897N, 6.6431W, 22.IV.2022, leg. G. Vinçon (2 males, OPC). Spain, Asturias, Puerto de Tarna, brook and springs, from 1130m, 43.1095°N, 5.2188°W, to 1220m, 43.1073°N, 5.2159°W, 12.X.2022, leg. Gilles Vinçon (1 male, OPC).

***Catagapetus nigrans* McLachlan, 1884**

Material examined. **Italy**, Marches, Parco Nazionale dei Monti Sibillini, nice torrent at Ussita, 730 m, 42.943°N, 13.138°E, 18.V.2022, leg. G. Vinçon (2 males, OPC). Italy, Marches, E. Purello, nice spring and two brooks, 530 m, 43.32°N, 12.7733°E, 20.V.2022, leg. G. Vinçon (1 male, OPC).

Ptilocolepidae Martynov, 1913

These small caddisflies with somewhat iridescent rounded forewing of 4–6 mm and primitive neuration populate hygropetric habitats of montane springs and seeps, among growths of moss and liverwort (Marshall 1979). *Ptilocolepus granulatus* (Pictet, 1834) was originally described in the *Rhyacophila* genus, later shown to be a senior synonym of *Ptilocolepus turbidus* Kolenati, 1848 (Hagen 1855), the type species thus became *Ptilocolepus granulatus*. McLachlan (1879) discussed its taxonomic status among rhyacophilids and glossosomatids. Describing its larval stage Thieneman (1904) noted its hydroptilid affinities, with the conclusion that it fits neither in the Glossosomatinae of Rhyacophilidae nor in Hydroptilidae. This position somehow prompted Ulmer (1907) to place the genus in the Hydroptilidae. Martynov (1913) describing two new species

from the Caucasus erected the Ptilocolepinae subfamily for the nominate genus retaining its taxonomic position in the Rhyacophilidae family. Finally, Ross (1956) transferred the subfamily to Hydroptilidae with inclusion of *Ptilocolepus* and *Palaeagapetus* genera.

Completing Thieneman (1904) findings, Malicky (2001) recently has raised the Ptilocolepinae subfamily to family rank: Ptilocolepidae Martynov, 1913. However, its taxonomic position was retained as a subfamily within Hydroptilidae by Holzenthal *et al.* (2007). The migration of *Ptilocolepus* through the Trichoptera system was discussed by Malicky (2008) and documented by Thieneman's original text.

Isolation and delineation by harpago

Harpago, harpagones in plural, is the grabbling terminal structure, the second segment of the gonopod usually with important functions in sexual processes. Already McLachlan (1879, 1884) has used exclusively the shape of harpago to separate species in the *Ptilocolepus* genus as well as presented rather reliable drawings of the furcate harpago suggesting that more species are hidden under the name of *Ptilocolepus granulatus*. He figured the differences in the lateral profile of the furcated harpago between specimens from Belgium and from the Pyrenees.

Diversity rate is significantly increasing from non-genital structures through non-intromittent genital structures to intromittent genital structures of the phallic organ. This gradient of diversity pattern suggests empirically that divergence mechanisms are driven by sexual integration (selection) operating in relation to sensory manipulation in mating, to ability of sperm removal in sperm competition, to control fertilization in sexual conflict, and to induce post-copulatory, prezygotic sperm selection in cryptic female choice (Arnquist 1997), the postcopulatory equivalent of the classic Darwinian precopulatory female choice.

Harpago could function as grasping, sensory, titillating, or even a harming organ liable to diver-

sify in isolation and producing distinct species by both prezygotic and postzygotic reproductive isolation that is performing the magic role of speciation traits and enabling us to delineate these incipient, sibling species.

Harpagones are almost completely fused to the gonopods with (*P. atiloma*) or without (*P. namnao*) visible vestigial sutures. The densely setosed gonopods themselves are fused completely (*P. atiloma*, *P. namnao*) or partially and definitely more ancestrally than the harpago. Based on the more recently diverging harpago structure, reflecting its integrative organization with speciation trait function and applying the principle of complex is plesiomorphic we distinguished three lineages in the *Ptilocolepus* genus. (1) *Ptilocolepus colchicus* species complex; (2) *Ptilocolepus granulatus* species complex; (3) *Ptilocolepus atiloma* species complex.

***Ptilocolepus colchicus* species complex**

The gonopods are partially fused with the vestigial basal plate present in mesal position in the form of heavily sclerotized structure ending in an apical spine. Harpago fused to the coxopodite apicad forming a specific lobe pattern together with the gonopod. *Ptilocolepus colchicus* Martynov, 1913 specimens from Georgia, Iran and Turkey listed below, are cleared, cleaned and examined. Based on the lateral profile of the harpago they may represent several sibling species, but we do not describe them here.

***Ptilocolepus colchicus* Martynov, 1913**

(Map 1)

Ptilocolepus colchicus Martynov, 1913:26–27. In Russian: Type specimen: “1♂. Forested mountain stream near Kvareli (Georgia) 21.VI.1907, leg. A. Martynov.”

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 (2 males, OPC; 3 males, 4 females; NMPC); Georgia, 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 (4 males, 1 female; OPC; 4 males, 1 female, NMPC); Georgia, 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, Guria 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). **Iran**, Gilan Province, South of Bandar Anzali, Talesh Mountain, small tributary to Masula River, 12.VIII.1990, leg. J. Oláh (2 males, OPC). Iran, Gilan Province, South of Bandar Anzali, Talesh Mountain, small tributary to Masula River, 16.IV.1991, leg. J. Oláh (2 males, OPC). **Turkey**, NE Anatolia, Rize prov., Çat SW of Çamlıhemşin - springs, brooks, 40°51.6'N 40°56.6'E; ca.1290 m, 9.VII.2013, leg. P. Chvojka (3 males, OPC; 5 males, 1 female; NMPC). Turkey, NE Anatolia, Artvin; source NE Hopa, 41 25 45 N, 41 26 50 E; 6.VII.1993, leg. P. Chvojka (3 males, OPC; 9 males, 8 females; NMPC). Turkey, NE Anatolia, Artvin; streams, Altıparmak NW Yusufeli, 40 57 00 N, 41 21 00 E; 7.VII.1993, leg. P. Chvojka (2 males, OPC; 9 males, 3 females; NMPC). Turkey, NE Anatolia, Trabzon; source, Sumela, 40 41 24 N, 39 39 39 E; 5.7.1993, leg. P. Chvojka (3 males, OPC; 4 males, 7 females; NMPC).

***Ptilocolepus granulatus* species complex**

The gonopods are almost entirely fused with some mesal excision on its apical margin. Harpago fused to the coxopodite on its dorsum subapicad. Mostly European species complex with one species in the Caucasus: *Ptilocolepus dilatatus* Martynov, 1913, *P. extensus* McLachlan, 1884; *Ptilocolepus granulatus* (Pictet, 1834); *Ptilocolepus kover* sp. nov.; *Ptilocolepus sovan* sp. nov.

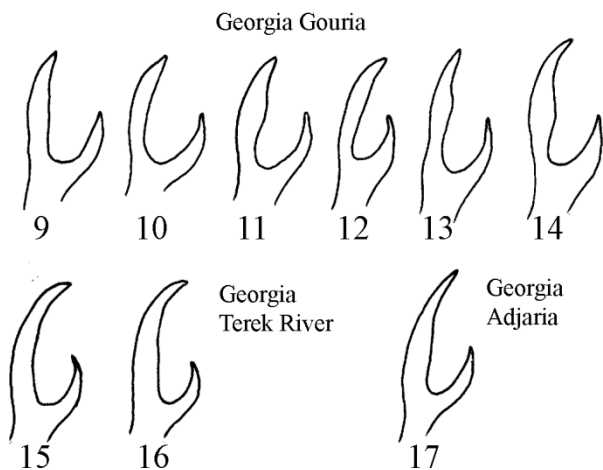
***Ptilocolepus dilatatus* Martynov, 1913**

(Figures 9–17) (Map 1)

Ptilocolepus dilatatus Martynov, 1913:23–26. In Russian: Type specimens: “2♂, 1♀. Mountain stream in gorge near Lagodekhi (Georgia), 17.VI.1907, leg. A. Martynov. 2♂. Mountain stream



Map 1. Distribution of Ptilocolepidae species in Asia (full circles represent the type localities).



Figures 9–17. *Ptilocolepus dilatatus* Martynov, 1913.
9–14 = Georgia, Gouria; 15–16 = Georgia, Terek River;
17 = Georgia, Adjara.

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 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 Nakeraf'skii, 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, side-stream 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).

***Ptilocolepus extensus* McLachlan, 1884**

(Map 2)

Ptilocolepus extensus McLachlan, 1884:70: "Portugal (between São Antonio and Coimbra, Beira Baixa,

3rd June, 1♂; near Cea, about 1800 ft., Beira Baixa, 11th June, 2♂, 1♀.”

Material examined. **Portugal**, Serra da Estrela Massif, above Loriga, nice brooklets, 940 m, 40.3381°N, 7.7074°W, 23.IV.2022, leg. G. Vinçon (1 male, OPC). **Portugal**, Serra da Estrela Massif, brooklet, on the snow, 1450–1480 m, 40.3802°N, 7.6457°W, 23.IV.2022, leg. G. Vinçon (4 males, 1 female; OPC). **Spain**, Galicia, south-west A Fonsagrada, brooklet and cascade, 750 m, 43.0726°N, 7.1785°W, 22.IV.2022, leg. G. Vinçon (6 males, OPC). **Spain**, Asturias, Puerto de Tarna, nice spring with abundant aquatic vegetation, 980 m, 43.1156°N, 5.2395°W, 21.IV.2022, leg. G. Vinçon (2 males, OPC). **Spain**, Galicia, West Ponte de Neira, nice springs tributaries of the Neira River, 550 m, 42.9185°N, 7.2147°W, 22.IV.2022, leg. G. Vinçon (4 males, OPC). **Spain**, Cantabria, above Yera, nice brook, 550–650 m, 43.1377°N, 3.7461°W, 20.IV.2022, leg. G. Vinçon (1 male, OPC). **Spain**, Cantabria, Peñarrubia, E Linares, resurgence, 420 m, 43.2554°N, 4.5741°W, 20.IV.2022, leg. G. Vinçon (4 males, 3 females; OPC). **Spain**, Asturias, Puerto del Palo Allande, brook and spring, 950 m, 43.2778°N, 6.6681°W up to 1000 m, 43.2764°N, 6.6725°W, 22.IV.2022, leg. G. Vinçon (7 males, OPC). **Spain**, Asturias, Somiedo, La Peral, brook and nice spring, 1360m, 43.0384°N, 6.2499°W, 13.X.2022, leg. Gilles Vinçon (2 males, OPC). **Spain**, Cantabria, Puerto de la Palombera, nice brook and seeping rocks, 1010 m, 43.0857°N, 4.2589°W, 11.X.2022, leg. Gilles Vinçon (3 males, OPC). **Spain**, Cantabria, Peñarrubia, E Linares, resurgence, 420m, 43.2554°N, 4.5741°W, 12.X.2022, leg. Gilles Vinçon (13 males, 9 females; OPC).

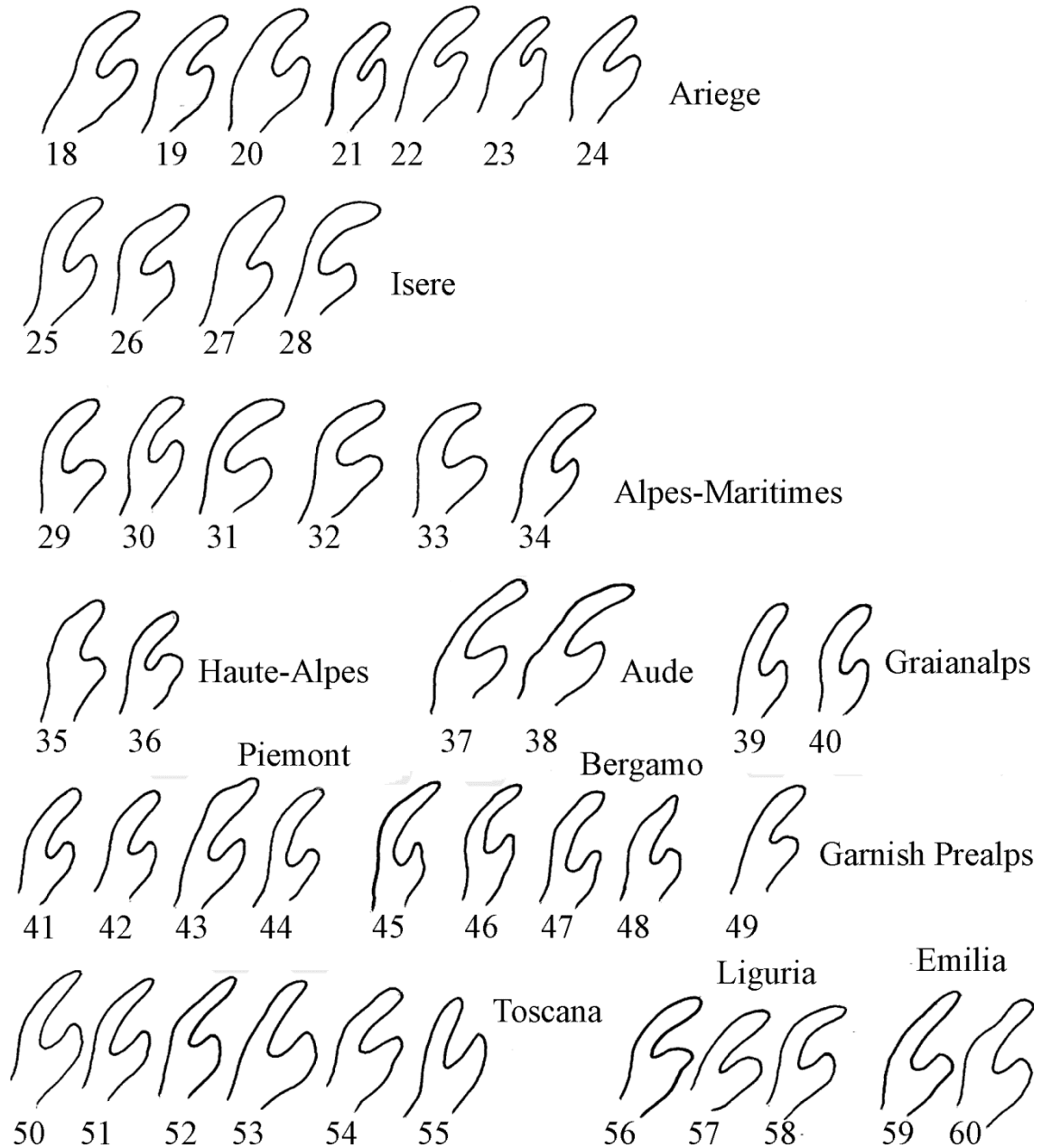
***Ptilocolepus granulatus* (Pictet, 1834)**

(Figures 18–60) (Map 2)

Rhyacophila granulata Pictet, 1834: 197–198. „J’ai trouvé cette espèce dans la vallée de Chamounix à la fin Juillet.”

Ptilocolepus granulatus (Pictet, 1834): McLachlan, 1879: 490. “France (Chamounix, Savoy, July, Pictet).”

Material examined. **France**, Ariège, below Crouzette Pass, nice spring, 760 m, 42.9137°N, 1.314°E, 15.IV.2022, leg. G. Vinçon (4 males, 2 females; OPC). **France**, Ariège, below Crouzette Pass, nice spring, 840 m, 42.9195°N, 1.3267°E 15.IV.2022, leg. G. Vinçon (1 male, 1 female; OPC). **France**, Ariège, above Biert, in direction of the Crouzette Pass, nice brook, 670 m, 42.9009°N, 1.3131°E, 15.IV.2022, leg. G. Vinçon (11 males, 2 females; OPC). **France**, Alpes-Maritimes, Courmes, brook, 570 m, 43.753°N, 7.005°E, 6.I.2022, leg. G. Vinçon (3 males, 5 females; OPC). **France**, Alpes-Maritimes, Caïros Valley, lateral spring, 1020 m, 44.011°N, 7.4602°E, 6.I.2022, leg. G. Vinçon (3 males, 1 female; OPC). **France**, Alpes-Maritimes, Caïros Valley, Fromagine spring, 1500m, 44.0208°N, 7.4317°E, 17.VII.2022, leg. Gilles Vinçon (9 males, 6 females; OPC). **France**, Isère, Vercors Massif, springs and brooks below Cascade de Moulin Marquis, 450 m, 45.0563°N, 5.4343°E, 11.III.2022, leg. G. Vinçon (9 males, 5 females; OPC). **France**, Hautes-Alpes, Queyras Massif, Vars Pass, above Guillestre, 1630 m, Nice spring, 44.6241°N, 6.6834°E, 14.V.2022, leg. G. Vinçon (2 males, OPC). **France**, Aude, Citou, 43.408°N 2.591°E, 906 m, 14.VII.2007, leg. M. Bálint (2 males, OPC). **Italy**, Graian Alps, Viu Valley, Borgial, big torrent, 45.203°N 7.302°E, 1500 m, 26.VI.2020, leg. Gilles Vinçon (2 males, 2 females; OPC). **Italy**, Ligurian Apennines, above Rocca d’Aveto, nice brook and spring, 1400 m, 44.555°N, 9.4767°E, 15.V.2022, leg. G. Vinçon (3 males, OPC). **Italy**, Ligurian Alps, above Garessio, brook and spring ‘Sorgente del Carulin’, 650 m, 44.1925°N, 8.0404°E, 15.V.2022, leg. Gilles Vinçon (4 males, 4 females; OPC). **Italy**, Emilie-Romagna, S. Cerreto Laghi, Fosso dei Fontanini, nice spring and brook, 1550 m, 44.28°N, 10.25°E, 11.VI.2022, leg. G. Vinçon (2 males, OPC). **Italy**, Emilie-Romagne, N.E. Passo Lagastrello, nice spring, 1110 m, 44.3562°N, 10.156°E, 17.V.2022, leg. G. Vinçon (1 male, OPC). **Italy**, Toscana, Passo di Cerreto, La Nuda Glacial Circus, spring + brook, 1440–1500 m, 44.2867°N, 10.2268°E, 10.VI.2022, leg. Gilles Vinçon (14 males, 26 females; OPC). **Italy**, Piemonte, Pennines Alps, Civiasco, spring below



Figures 18–60. *Ptilocolepus granulatus* (Pictet, 1834). Lateral profile of the harpago in 12 populations. 18–24 = Ariège, 25–28 = Isere, 29–34 = Alpes-Maritimes, 35–36 = Haute-Alpes, 37–38 = Aude, 39–40 = Graian Alps, 41–44 = Piemonte, 45–48 = Bergamo, 49 = Garnish Prealps, 50–55 = Toscana, 56–58 = Liguria, 59–60 = Emilia.

water catchment, 770 m, 45.8104°N, 8.2973°E, 27.V.2022, leg. Gilles Vinçon (2 males, OPC). Italy, Carniche Pre-Alps, Dolomiti Friuli, S. Preone, Casali Chiampon, nice spring and Arzino torrent, “il Fontanone”, 760 m, 46.3416°N,

12.8827°E, 24.V.2022, leg. G. Vinçon (1 male, OPC). Italy, Piemonte, brook and spring tributary of Stura di Demonte, above Villaggio Primavera, 1530 m, 44.373°N, 6.9755°E, 14.V.2022, leg. Gilles Vinçon (17 males, 7 females; OPC).

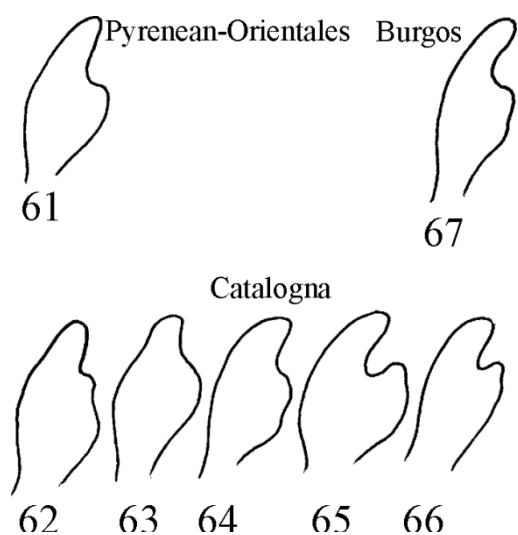
***Ptilocolepus kover* sp. nov.**

(Figures 61–67) (Map 2) (Photo 6)

Material examined. Holotype: **France**, Pyrénées-Orientales, above Sorède, La Farga, nice brook, 450 m, 42.4979N, 2.9572E, 30.IV.2022, leg. G. Vinçon (1 male, OPC). Paratypes: **Spain**, Catalogna, Rio Rilort tributary, above Espinavel, nice brooklet, 1220 m, 42.3812N, 2.3932E, 30.IV.2022, leg. G. Vinçon (5 males, OPC). Spain, Burgos, Espinosa de los Monteros, Portillo de Las Estecas de Trueba, Fuente Cornejo, spring, 1030 m, 43.1115N, 3.6786W, 19.IV.2022, leg. G. Vinçon (1 male, OPC).

Diagnosis. This new species with speciation trait of very fat harpago is closer to *Ptilocolepus granulatus*, the ancestral species of the complex, but the ventral lobe of the harpago is vestigial as well as the dorsal lobe much abbreviated.

Description. Small dark species with forewing length of 2 mm. Hyaline transparent spot window at the fork of the median veins small. The speciation trait, the harpago is fused subapical to the coxopodite. Its lateral profile is very specific; the lower or ventral lobe is much reduced or



Figures 61–67. *Ptilocolepus kover* sp. nov. Lateral profile of the harpago in 3 populations. Holotype: 61 = Pyrenees-Orientales, Paratypes: 62–66 = Catalogna, 67 = Burgos.

completely disappeared; the upper or dorsal lobe is very stout broad with rounded apex; the entire harpago is rounded fat.

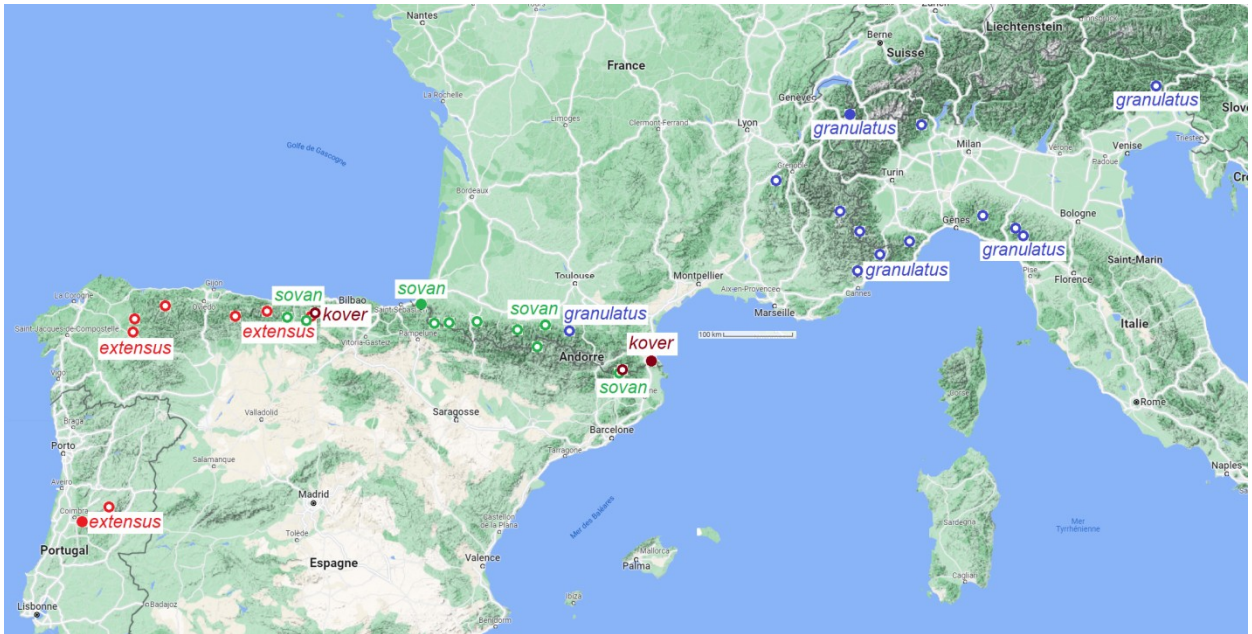
Etymology. *kover* from “kövér” fat in Hungarian, refers to the rounded, fat lateral profile of the harpago.

***Ptilocolepus sovan* sp. nov.**

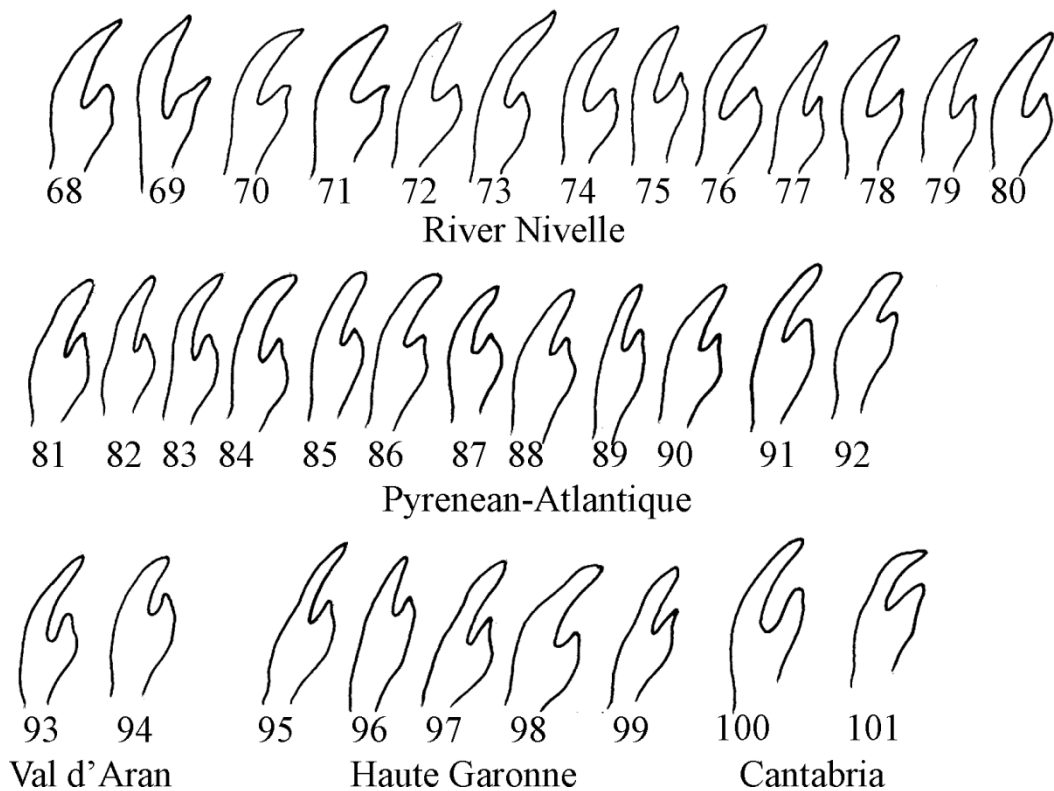
(Figures 68–101) (Map 2)

Material examined. Holotype: **France**, Pyrénées-Atlantiques, River system Nivelles, 12-18.VII.1986, leg. J. Oláh (1 male, OPC). Paratypes: same as holotype (16 males, 3 females; OPC). France, Pyrénées-Atlantiques, Marie-Blanche Pass, nice spring, 910 m, 43.0697N, 0.5213W, 18.IV.2022, leg. G. Vinçon (11 males, 2 females; OPC). France, Pyrénées-Atlantiques, Iraty, nice resurgence, 1100 m, 43.0451N, 1.0546W, 19.IV.2022, leg. G. Vinçon (2 males, OPC). France, Hautes-Pyrénées, N.W. Aspin Pass, 1450 m, nice brook, 42.9454N, 0.3202E, 17.IV.2022, leg. G. Vinçon (1 male, 3 females; OPC). France, Haute-Garonne, Arbas Massif, Fontaine de l’Ours, spring, 1190 m, 42.9647N, 0.8789E, 15.IV.2022, leg. G. Vinçon (8 males, 2 females; OPC). **Spain**, Val d’Aran, Artiga de Lin, nice spring and brook, 1150 m, 42.7073N, 0.7138E, 17.IV.2022, leg. G. Vinçon (2 males, 4 females; OPC). Spain, Cantabria, Puerto de la Palombera, nice brook and 2 cascades, 1010 m, 43.0857N, 4.2589W, 20.IV.2022, leg. G. Vinçon (1 male, OPC). Spain, Cantabria, above Yera, nice brook, 550-650 m, 43.1377N, 3.7461W, 20.IV.2022, leg. G. Vinçon (1 male, OPC). Spain, Catalogna, Rio Rilort tributary, above Espinavel, 2 brooks, 1350 m, 42.3811N, 2.3734E, and 1400 m, 42.3811N, 2.3665E, 30.IV.2022, leg. G. Vinçon (1 male, OPC). Spain, Navarra, Puerto de Ibañeta, Valcarlos, brook and spring, Luzaide tributary, 890 m, 43.0309N, 1.3435W, 19.IV.2022, leg. G. Vinçon (2 males, 1 female; OPC).

Diagnosis. This new Pyrenean and Cantabrian species with speciation trait of slender and pointed harpago is closer to *Ptilocolepus granulatus*, the ancestral species of the complex,



Map 2. Distribution of Ptilocolepidae species in Western Europe (full circles represent the type localities).



Figures 68–101. *Ptilocolepus sovan* sp. nov. Lateral profile of the harpago in 5 populations. Holotype: 68 = River Nivelles, Paratypes: 69–80 = River Nivelles, 81–92 = Pyrenees-Atlantique, 93–94 = Val d'Aran, 95–99 = Haute-Garonne, 100–101 = Cantabria.



Figures 102–103. *Ptilocolepus atiloma* Schmid, 1990 and *Ptilocolepus namnao* Malicky, 1996. Lateral profile of the gonopod. 102 = *Ptilocolepus atiloma*, 103 = *Ptilocolepus namnao*

but the excision between the dorsal and ventral lobes is narrow, not wide; the dorsal arm is slim, slender with pointed apex, not so slim with rounded apex; the ventral lobe is abbreviated and pointed, not long and rounded.

Description. Small dark species with forewing length of 2 mm. Hyaline transparent spot window at the fork of the median veins small. The harpago, second segment of gonopod is fused subapically to the coxopodite. Its lateral profile is characterized with pointed lobe apices; the lower or ventral lobe is short abbreviated with pointed, tapering apex; the upper or dorsal lobe is slender with pointed apex; the excision between dorsal and ventral lobes are very narrow.

Etymology. *sovan* from “sovány” thin or lean in Hungarian, refers to the slim lateral profile of the harpago.

***Ptilocolepus atiloma* new species complex**

The gonopods are almost entirely fused with some mesal less sclerotized region. Harpago fused to the coxopodite with (*P. atiloma*) or without (*P.*

namnao) vestigial sutures as a direct tapering structural continuation. Oriental species: *Ptilocolepus atiloma* Schmid, 1990 from India and *P. namnao* Malicky & Chantaramongkol, 1996 from Thailand.

***Ptilocolepus atiloma* Schmid, 1990**

(Figures 102) (Map 1)

Ptilocolepus atiloma Schmid, 1990:239–241. “Holotype ♂ Inde, Assam, United Jaintia and Khasi Hills, Mawpran, 4–7.II.1961. Allotype ♀: Ibid., Tarangblang, 27.XII.1959 (CNC 21234).” “La découverte d’un *Ptilocolepus* en Assam est très inattendue, car ce genre n’avait encore jamais été signalé hors la région européenne, dont il semblait être un des éléments faunistiques typiques.”

***Ptilocolepus namnao* Malicky, 1996**

(Figures 103) (Map 1)

Ptilocolepus namnao Malicky, 1996:119. “HT♂: Thailand, Nam Nao NP, 800m, 16.–17.IV.1996.” “♂ Kopulationsarmaturen: Sehr ähnlich den anderen Arten, besonders *P. atiloma*. Die untere Anhänge sind in eine lange dünne Spitze ausgezogen, und ihre theoretische Zweigliedrigkeit ist nicht zu erkennen.”

Brachycentridae Ulmer, 1903

***Micrasema servatum* Navas, 1918,**

Material examined. **Spain**, Galicia, south-west A Fonsagrada, brooklet and cascade, 750 m, 43.0726°N, 7.1785°W, 22.IV.2022, leg. G. Vinçon (4 males, OPC). Spain, Asturias, Puerto de Tarna, nice spring with abundant aquatic vegetation, 980 m, 43.1156°N, 5.2395°W, 21.IV.2022, leg. G. Vinçon (4 males, OPC). Spain, Asturias, Puerto de Leitariegos, Brañas de Arriba, nice spring, 1400 m, 43.0128°N, 6.4451°W, 21.IV.2022, leg. G. Vinçon (1 male, OPC). Spain, Galicia, West Ponte de Neira, nice springs tributaries of the Neira River, 550 m, 42.9185°N, 7.2147°W, 22.IV.2022, leg. G. Vinçon (4 males, OPC). Spain, Asturias, road to the Puerto del Palo Allande, nice brook, 720 m, 43.2897°N, 6.6431°W, 22.IV.2022, leg. G. Vinçon (8 males,

OPC). Spain, Asturias, Somiedo, La Peral, brook and nice spring, 1360m, 43.0384°N, 6.2499°W, 13.X.2022, leg. Gilles Vinçon (2 males, OPC).

***Micrasema vestitum* Navas, 1918**

Material examined. **France**, Pyrénées-Atlantiques, Osse-en-Aspe, Labays Pass, Oueils d'Is-saux, nice resurgence, 680 m, 43.00655°N, 0.6913°W, 18.IV.2022, leg. G. Vinçon (2 males, OPC). **France**, Pyrénées-Orientales, Canigou Massif, Prats-de-Mollo-la-Preste, nice brook and spring, 1860 m, 42.4523°N, 2.4102°E, 30.IV.2022, leg. G. Vinçon (2 males, OPC).

Uenoidae Iwata, 1927

Thremmatinae Martynov, 1935

***Thremma tellae* González, 1978**

Material examined. **Portugal**, Serra da Estrela Massif, above Loriga, torrent, 850 m, 40.333°N, 7.6869°W, 23.IV.2022, leg. G. Vinçon (1 male, OPC). **Portugal**, Serra da Estrela Massif, brooklet, on the snow, 1450–1480 m, 40.3802°N, 7.6457°W, 23.IV.2022, leg. G. Vinçon (1 male, OPC). **Spain**, Castilla y Leon, Sierra de Gredos, Hoyos del Espino, nice brook with abundant aquatic vegetation, 1470 m, 40.3582°N, 5.1773°W, 24.IV.2022, leg. G. Vinçon (1 male, OPC). **Spain**, Galicia, North-East Manzaneda, brook, 670 m, 42.3055°N, 7.2305°W, 22.IV.2022, leg. G. Vinçon (1 male, OPC). **Spain**, Galicia, West Ponte de Neira, nice springs tributaries of the Neira River, 550 m, 42.9185°N, 7.2147°W, 22.IV.2022, leg. G. Vinçon (2 males, OPC). **Spain**, Castilla y Leon, Sierra de Candelario, Rio Becedillas at Becedas, 1110 m, 40.4013°N, 5.6371°W, 23.IV.2022, leg. G. Vinçon (1 male, OPC). **Spain**, Communauté de Madrid, Sierra de Guadarrama, South-West Rascafria, nice brook, 1450 m, 40.8361°N, 3.9131°W, 26.IV.2022, leg. G. Vinçon (6 males, OPC). **Spain**, Cantabria, above Yera, nice brook, 550–650 m, 43.1377°N, 3.7461°W, 20.IV.2022, leg. G. Vinçon (5 males, OPC). **Spain**, Castilla y Leon, Sierra de Gredos, road to 'La Plataforma de Gredos', big brook,

1490 m, 40.304°N, 5.2088°W, 24.IV.2022, leg. G. Vinçon (26 males, 4 females; OPC). **Spain**, Cantabria, Puerto de la Palombera, brook, 1020m, 43.0847°N, 4.2515°W, 11.X.2022, leg. Gilles Vinçon (2 males, OPC). **Spain**, Cantabria, Puerto de la Palombera, nice brook and seeping rocks, 1010m, 43.0857°N, 4.2589°W, 11.X.2022, leg. Gilles Vinçon (1 male, OPC). **Spain**, Cantabria, Vega de Pas, brook and cascade, arroyo Enverao, 900m, 43.1208°N, 3.7133°W, 11.X.2022, leg. Gilles Vinçon (1 male, OPC). **Spain**, Asturias, Puerto del Palo Allande, brook and spring, from 950m, 43.2778°N, 6.6681°W, up to 1000m, 43.2764°N, 6.6725°W, 13.X.2022, leg. Gilles Vinçon (1 male, OPC).

Goeridae Ulmer, 1903

***Lithax niger* (Hagen, 1859)**

Material examined. **France**, Isère, Taillefer Massif, below Brouffier lake, spring Guiliman tributary, 1850 m, 45.033°N, 5.877°E, 21.06.2022, leg. G. Vinçon (2 males, 3 females; OPC). **Italy**, Julian Alps, W. Sella Nevea, brook, 1040 m, 46.3897°N, 13.4693°E, 24.05.2022, leg. G. Vinçon (4 males, 1 female; OPC). **Italy**, Atesine Alps, N. Maranza, spring and brook, 1590 m, 46.8345°N, 11.6479°E, 25.V.2022, leg. G. Vinçon (2 males, 3 females; OPC). **Italy**, Atesine Alps, N. Maranza, big brook near Hexenhütte, 1750 m, 46.8562°N, 11.6637°E, 25.V.2022, leg. G. Vinçon (6 males, 5 females; OPC). **Italy**, Rhaetian Alps, above Livigno, brook, 2130m, 46.5308°N, 10.1539°E, 25.V.2022, leg. G. Vinçon (3 males, 2 females; OPC). **Italy**, Aosta Valley, High Ayas Valley, above St Jacques, near 'Alpe Mase', nice spring, 2400 m, 45.8929°N, 7.7039°E, 11.VI.2022, leg. G. Vinçon (2 males, OPC).

***Lithax obscurus* (Hagen, 1859)**

Material examined. **Italy**, Marches, E. Purello, nice spring and two brooks, 530 m, 43.32°N, 12.7733°E, 20.V.2022, leg. G. Vinçon (9 males, 7 females; OPC).

Remark. This species is new for the Italian Fauna.

Lepidoptomatidae Ulmer, 1903

***Crunoecia irrorata* Curtis, 1834**

Material examined. **Italy**, Molise, Castel San Vincenzo, Sorgente Acquaruolo, 470 m, 41.6594° N, 14.078°E, 19.V.2022, leg. G. Vinçon (1 male, OPC).

***Crunoecia kempnyi* Morton, 1901**

Material examined. **Italy**, Julian Alps, S. Fusine, nice spring below the water catchment, 840 m, 46.4922°N, 13.6689°E and two nice springs at 910 m, 46.4857°N, 13.6735°E, 23.V.2022, leg. G. Vinçon (2 males, 6 females; OPC). **Slovenia**, N.E. Bovec, nice seeping rocks, 430 m, 46.3399° N, 13.5745°E, 21.V.2022, leg. G. Vinçon (1 male, OPC).

Remark. This species is new for the Italian Fauna.

Apataniidae Wallengren, 1886

***Apatania eatoniana* McLachlan, 1880**

Material examined. **France**, Pyrénées-Atlantiques, Osse-en-Aspe, Labays Pass, Oueils d'Issaux, nice resurgence, 680m, 43.00655°N, 0.6913°W, 18.IV.2022, leg. G. Vinçon (3 males, 1 female; OPC). **France**, Pyrénées-Atlantiques, Iraty, resurgence, 1100 m, 43.0451°N, 1.0546°W, 19.IV.2022, leg. G. Vinçon (1 male, OPC). **France**, Pyrénées-Atlantiques, Marie-Blanche Pass, nice brook, 1050 m, 43.0643°N, 0.5033°W, 18.IV.2022, leg. G. Vinçon (12 males, OPC). **Spain**, Cantabria, Puerto del Ponton, nice spring and brook, 1180 m, 43.1036°N, 5.0157°W, 21.IV.2022, leg. G. Vinçon (7 males, 1 female; OPC). **Spain**, Navarra, Puerto de Ibañeta, Valcarlos, brook and spring, Luzaide tributary, 890 m, 43.0309°N, 1.3435°W, 19.IV.2022, leg. G. Vinçon (7 males, 1 female; OPC). **Spain**, Asturias, Puerto del Palo Allande, brook and spring, 950 m, 43.2778°N, 6.6681°W up to 1000 m, 43.2764°N, 6.6725°W, 22.IV.2022, leg. G. Vinçon (4 males, 1 female; OPC). **Spain**, Asturias,

Somiedo, La Peral, brook and nice spring, 1360m, 43.0384°N, 6.2499°W, 13.X.2022, leg. Gilles Vinçon (3 males, 1 female; OPC).

***Apatania fimbriata* Pictet, 1834**

Material examined. **France**, Ariège, below Crouzette Pass, nice spring, 840 m, 42.9195°N, 1.3267°E, 15.IV.2022, leg. G. Vinçon (2 males, 1 female; OPC). **France**, Ariège, path to Arlu Lake, nice spring, 1650m, 42.8142°N, 1.438°E, 9.X.2022, leg. Gilles Vinçon (2 males, OPC).

Limnephilidae Kolenati, 1848

Drusinae Banks, 1916

***Drusus annulatus* Stephens, 1837**

Material examined. **France**, Isère, Taillefer Massif, below Brouffier lake, spring Guiliman tributary, 1850 m, 45.033°N, 5.877°E, 6.VIII.2022, leg. Gilles Vinçon (1 male, OPC).

***Drusus apados* Oláh & Coppa, 2017**

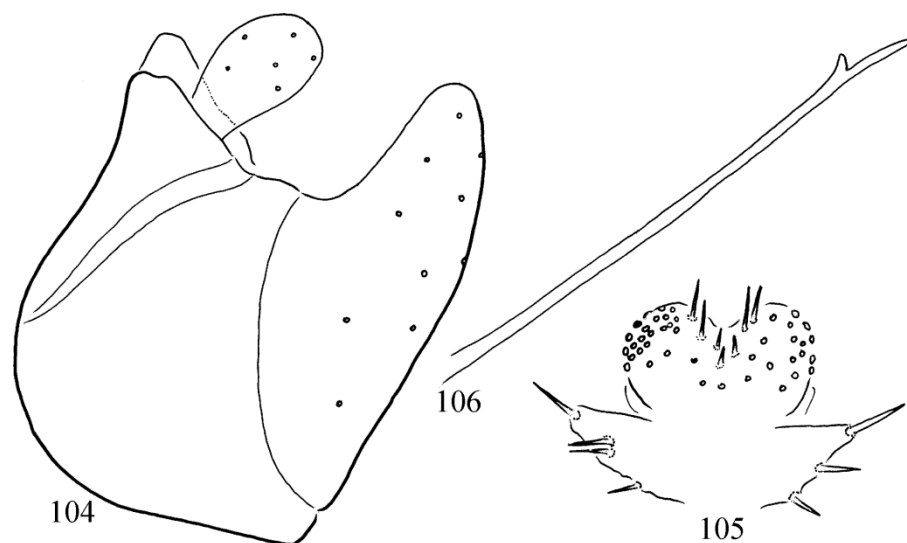
Material examined. **France**, Drôme, South Vercors Massif, Archiane, nice big resurgence, 770 m, 44.7461°N, 5.5064°E, 13.V.2022, leg. G. Vinçon (8 males, 14 females; OPC). **France**, Drôme, South Vercors Massif, Archiane, nice big resurgence, 770 m, 44.7461°N, 5.5064°E, 15.VI.2022, leg. G. Vinçon (25 males, 5 females; OPC).

***Drusus roya* sp. nov.**

(Figures 104–106) (Map 3) (Photos 7, 8)

Material examined. Holotype: **France**, Alpes-Maritimes, Caïros Valley, tributary of Roya Valley, lateral spring, 1020 m, 44.011°N, 7.46°E, 17.VII.2022, leg. Gilles Vinçon (1 male, OPC).

Diagnosis. A new species related to the *Drusus lepidopterus* siblings of the *D. greacus* species complex in the *Drusus bosnicus* species group. This species belongs to the southern group of *D. lepidopterus* siblings with pronounced microplate structures in the surface pattern on the



Figures 104–106. *Drusus roya* sp. nov. Holotype: 104 = genitalia in left lateral view, 105 = Paraproct in dorsal view; 106 = phallic organ in lateral view.

dorsal surface of the fused dorsal branches of the paraproct. The new species *D. roya* is most close to *D. lepidopterus*, but differs by both the shape and the surface pattern of the fused dorsal branch of the paraproct in dorsal view. The partially fused lobes of the dorsal arms of paraproct are rounded circular, not quadrangular; its basolateral lobes are longer; 2–3 primary setae of macrochaetes present also on the middle region.

Description. Black, large species with forewing length of 14 mm. The architectural shape of the dorsal profile of the fused dorsal arm of the paraproct is characterized by two circular lobes. Composed of the pair of fused circular dorsal arms and the triangular basolateral pair of lobes. The microplate field very pronounced, dominating on the surface; the entire surface is almost fully covered with small circular microplates having some pointed central outgrowth. The mesal suture line indiscernible. The paramere setal pattern of the holotype symmetrical, the erect, primary spine is short and robust.

Etymology. Name coined from the name of the type locality as a noun in apposition.

Remark. In the Roya Valley both siblings occur; *D. roya* sp. nov. and *D. lepidopterus* (Oláh *et al.* 2021, Oláh *et al.* 2022).

***Drusus camerinus* Moretti, 1981**

Material examined. **Italy**, Marches, E. Purrello, nice spring and two brooks, 530 m, 43.32°N, 12.7733°E, 20.V.2022, leg. G. Vinçon (2 males, OPC). Italy, Marches, Parco Nazionale dei Monti Sibillini, Panico Valley, nice brook and spring, 1180 m, 42.945°N, 13.1995°E, 18.V.2022, leg. G. Vinçon (9 males, 4 females, OPC).

***Drusus demonta* sp. nov.**

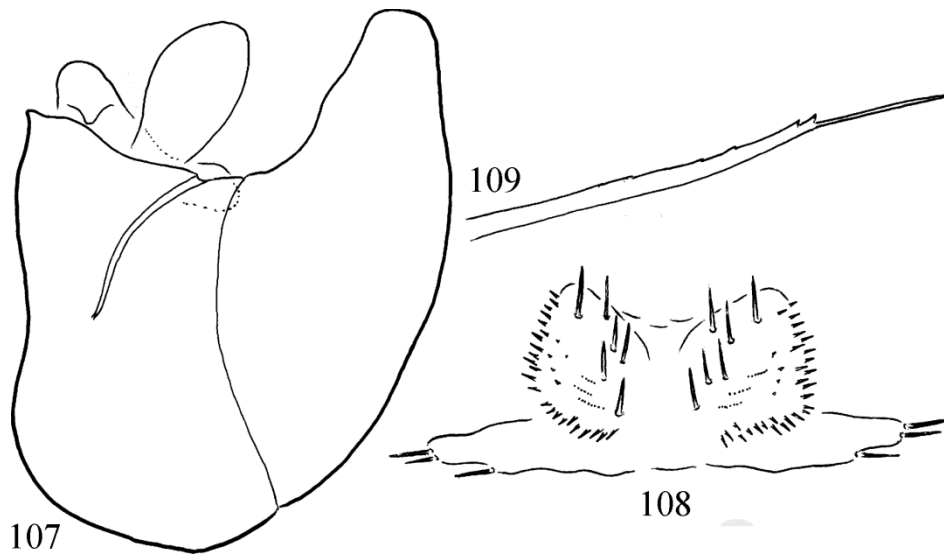
(Figures 107–109) (Map 3) (Photo 9)

Material examined. Holotype: **Italy**, Piémont, brook and spring tributary of Stura di Demonte, above Villaggio Primavera, 1530 m, 44.373°N, 6.9755°E, 14.V.2022, leg. Gilles Vinçon (1 male, OPC).

Diagnosis. A new species related to the *Drusus lepidopterus* siblings of the *D. greacus* species complex in the *Drusus bosnicus* species



Map 3. Distribution of the *Drusus lepidopterus* siblings in the western Alps and northern Apennines (full circles represent the type localities).



Figures 107–109. *Drusus demonta* sp. nov. Holotype: 107 = genitalia in left lateral view, 108 = paraproct in dorsal view; 109 = phallic organ in lateral view.

group. This species belongs to the northern group of *D. lepidopterus* siblings without pronounced microplate structures in the surface pattern on the

dorsal surface of the fused dorsal branches of the paraproct. The new species *D. demonta* is most close to *D. piemontensis*, lives and was collected

together in the same habitat, but differs by both the shape and the surface pattern of the fused dorsal branch of the paraproct in dorsal view as well as radically differs by the spine pattern of the paramere. The partially fused lobes of the dorsal arms of paraproct are trapezoid, not rounded and more subdivided; its basolateral lobes are triple longer; 2–3 primary setae of macrochaetes present also on the middle region. The single robust and erected primary paramere spine characterizing all the known species of the siblings is unique in *Drusus demonta* sp. nov., reduced in size and subdivided.

Description. The forewing of the male is completely covered with slightly elongated scales; forewing length 9 mm. The architectural shape of the dorsal profile of the fused dorsal arm of the paraproct is characterized by complex amalgamated lobe system. Composed of the pair of fused vestigial dorsal arms and the elongated basolateral pair of lobes. There is no microplate field discernible; the entire surface is almost fully covered with short microspines as well as short transversal lines of spots as visible in dorsal view. The mesal suture line vestigial, present markedly apicad. The paramere setal pattern of the holotype asymmetrical, the erect, primary spine is uniquely subdivided, less pronounced; lateral and basal margin full of small tertiary spines.

Etymology. Name coined from the name of the type locality as a noun in apposition.

Remark. The distribution area of *D. demonta* sp. nov. meets the southern edge of the distribution area of its closest sibling *D. piemontensis* (Map 3).

***Drusus discolor* (Rambur, 1842)**

Material examined. **France**, Isère, Taillefer Massif, below Brouffier lake, Guiliman, 1990 m, 45.0354N, 5.884E, 6.VIII.2022, leg. G. Vinçon (1 male, 1 female, OPC). **France**, Alpes-de-Haute-Provence, > Cayolle Pass, spring and brook, 2460 m, 44.258N, 6.733E, 18.VII.2022, leg. G. Vinçon (6 males, 3 females, OPC).

***Drusus flavipennis* (Pictet, 1834)**

Material examined. **France**, Alpes-de-Haute-Provence, > Cayolle Pass, spring and brook, 2460 m, 44.258°N, 6.733°E, 18.VII.2022, leg. G. Vinçon (1 male, OPC).

***Drusus improvisus* (McLachlan, 1884)**

Material examined. **Toscana**, Passo del Cerreto, 1400–1500 m, springs and brooks, 44.285°N, 10.2286°E, 17.V.2022, leg. G. Vinçon (1 male, 1 female, OPC). **Italy**, Emilie-Romagne, Lagdei, brook and spring near the peat bog, 1270 m, 44.4122°N, 10.0075°E, 16.V.2022, leg. G. Vinçon (1 male, OPC). **Italy**, Ligurian Apennines, above Rocca d'Aveto, spring, 1640 m, 44.5598°N, 9.4872°E, 15.V.2022, leg. Gilles Vinçon (3 males, 2 females; OPC). **Italy**, Toscana, Passo di Cerreto, La Nuda Glacial Circus, spring + brook, 1440–1500 m, 44.2867°N, 10.2268°E, 10.VI.2022, leg. Gilles Vinçon (14 males, 26 females; OPC).

***Drusus lapos* Oláh, 2017**

Material examined. **Italy**, Dolomiti, S.E. Moso, Parco Naturale Tre Cime, many springs below water captures, trib. Rio Bianco, 1650 m, 46.6557N, 12.4062E, 24.V.2022, leg. Gilles Vinçon (2 males, 1 female; OPC).

Remark. Based upon the lateral profile of the dorsal arm of paraproct and on the spine pattern of paramere we have distinguished two separate distinct species hidden under the name of *Drusus chrysotus* (Oláh *et al.* 2017). *Drusus chrysotus* (Rambur, 1842) the western sibling species and *Drusus lapos* Oláh, 2017 the eastern sibling species. All the examined specimens from France, Western Switzerland, and Western Italy represent *Drusus chrysotus* and all the specimens from Eastern Switzerland, Eastern Italy, Austria and Czech Republic represent *Drusus lapos*.

In the lateral profile the dorsum of the fused dorsal branches of paraproct is sloping anterad at *D. chrysotus* and flat horizontal at *D. lapos*.

Subapical spine on the paramere subdivided into two spines at *D. chrysotus* and not divided; only a sole spine is present at *D. lapos*. Recent collection of a single male of *Drusus chrysotus* in France (Oláh *et al.* 2022) and the present collection of two males and a single female have confirmed the stability of the paraproct and paramere divergences of the two sibling species.

***Drusus liguriensis* Oláh, 2017**

(Map 3)

Material examined. **Italy**, Ligurian Apennines, above Rocca d'Aveto, nice brook and spring, 1400 m, 44.555°N, 9.4767°E, 15.V.2022, leg. G. Vinçon (1 male, 1 female, OPC). Italy, Emilie-Romagne, above Lagdei, lateral spring, 1290 m, 44.4098°N, 10.01°E, 16.V.2022, leg. G. Vinçon (1 male, 3 females, OPC). Italy, Emilie-Romagne, above Prato Spilla, 1450 m, 44.3578°N, 10.1057°E, 16.V.2022, leg. G. Vinçon (4 males, 2 females, OPC).

Remark. Lodovici & Valle (2020) mistakenly did not report this species from Italy. Its distribution area extends much to the east in the Northern Apennines and nearly meets the distribution area of its two siblings, *D. cerreto* Oláh & Vinçon, 2021 and *D. apuanensis* Oláh, 2017 (Map 3).

***Drusus magas* Oláh, 2017**

Material examined. **Italy**, Aosta Valley, High Ayas Valley, St Jacques, above Lago Blu, nice torrent, 2400 m, 45.8964°N, 7.7457°E, 12.VI.2022, leg. G. Vinçon (3 males, OPC). Italy, Aosta Valley, High Ayas Valley, St Jacques, above Lago Blu, big spring, 2470 m, 45.89775°N, 7.7471°E, 12.VI.2022, leg. G. Vinçon (5 males, OPC).

Remark. In our previous study (Oláh & Vinçon 2022), we described *D. italiano* Oláh & Vinçon, 2022, close to *D. magas*, and at that time we thought that “It seems that all the known Italian specimens belong to the new species *D. italiano* and *D. magas* Oláh, 2017 is represented only by Swiss specimens, by the holotype and by the

drawings of Schmid (1956) from Swiss specimen under the name *D. muelleri*.” Now we can confirm that both species *D. italiano* and *D. magas* are sympatric in the Italian Pennines Alps.

***Drusus malickyi* (Sipahiler, 1992)**

Material examined. **France**, Drôme, South Vercors Massif, Archiane, nice big resurgence, 770 m, 44.7461°N, 5.5064°E, 11.III.2022, leg. G. Vinçon (3 males, OPC).

***Drusus marinettae* Sipahiler, 1992**

Material examined. **France**, Pyrénées-Orientales, Puigmal Massif, Ribera d'Err, 1900-2200 m, 42.3855°N, 2.0926°E, 14.IV.2022, leg. G. Vinçon (1 male, OPC). France, Pyrénées-Orientales, Canigou Massif, Prats-de-Mollo-la-Preste, nice brook and spring, 1860 m, 42.4523°N, 2.4102°E, 30.IV.2022, leg. G. Vinçon (2 males, OPC). France, Pyrénées-Orientales, Canigou Massif, above Mantet, Rotja tributary, 1850 m, nice big spring, 42.4755°N, 2.325°E, 14.IV.2022, leg. G. Vinçon (1 male, OPC).

***Drusus melanchaetes* McLachlan, 1876**

Material examined. **Italy**, Aosta Valley, High Ayas Valley, St Jacques, above Lago Blu, nice torrent, 2400 m, 45.8964°N, 7.7457°E, 12.VI.2022, leg. G. Vinçon (5 males, 3 females; OPC). Italy, Aosta Valley, High Ayas Valley, above St Jacques, N.E. ‘Alpe Mase’, spring and brook, 2530 m, 45.8965°N, 7.7093°E, 11.06.2022, leg. G. Vinçon (2 males, OPC).

***Drusus mixtus* (Pictet, 1834)**

Material examined. **Switzerland**, Jura Massif, Soubey, Bief de la Côte au Bouvier, 600–650 m, 47.3°N, 7.06°E, 13.III.2022, leg. G. Vinçon (9 males, 3 females; OPC).

***Drusus monticola* McLachlan, 1876**

Material examined. **Italy**, Rhaetian Alps, S.W. Passo dello Stelvio, springs and brooks, 2030 m,

46.5152°N, 10.4057°E, 25.V.2022, leg. G. Vinçon (2 males, 1 female; OPC). Italy, Dolomiti, S.E. Moso, Parco Naturale Tre Cime, many springs below water captures, trib. Rio Bianco, 1650 m, 46.6557°N, 12.4062°E, 24.V.2022, leg. Gilles Vinçon (1 male, OPC).

***Drusus nebulicola* (McLachlan, 1867)**

Material examined. France, Isère, Alpe du Grand Serre, Lavalens, Rif bruyant, 1860 m, dessous cascade, 44.9513°N, 5.911°E, 14.VII.2022, leg. Gilles Vinçon (6 males, 18 females; OPC).

***Drusus piemontensis* Oláh, 2017**

(Map 3)

Material examined. Italy, Piémont, brook and spring tributary of Stura di Demonte, above Villaggio Primavera, 1530 m, 44.373°N, 6.9755°E, 14.V.2022, leg. Gilles Vinçon (1 male, OPC). Italy, Piémont, brook and spring tributary of Stura di Demonte, above Villaggio Primavera, 1530 m, 44.373°N, 6.9755°E, 16.VII.2022, leg. G. Vinçon (6 males, OPC).

***Drusus spelaeus* (Ulmer, 1920)**

Material examined. France, Drôme, Vercors, Tourtre, Adouin, 760 m, 45.0035°N, 5.4563°E, 11.III.2022, leg. G. Vinçon (3 males, OPC).

***Drusus thibaulti* Decamps, 1972**

Material examined. Spain, Navarra, Puerto de Ibañeta, Valcarlos, brook and spring, Luzaide tributary, 890 m, 43.0309°N, 1.3435°W, 19.IV.2022, leg. G. Vinçon (2 males, 1 female; OPC).

Remarks. The recollection of this rare species is a great luck! During our revision of Drusinae subfamily we were unable to examine the type or any other specimens. The examination of the two males and single female confirm our conclusion based on the original description and drawings that this is a distinct independent species. (Oláh *et*

al. 2017). This species is probably new for the Spanish Fauna.

***Drusus vinconi* Sipahiler, 1992**

Material examined. France, Pyrénées-Atlantiques, Osse-en-Aspe, Labays Pass, Oueils d'Issaux, nice resurgence, 680 m, 43.00655°N, 0.6913°W, 18.IV.2022, leg. G. Vinçon (3 males, 2 females; OPC). France, Pyrénées-Atlantiques, Osse-en-Aspe, Oueils d'Issaux, nice resurgence, 720m, 43.0045°N, 0.693°W, 10.X.2022, leg. Gilles Vinçon (1 male, 1 female; OPC).

Remarks. This large elegant species was described from a single male accompanied by 5 females collected at the end of June, 1987 by Gilles Vinçon in the Pyrénées-Atlantiques, France. The single male holotype and the female allotypes were re-examined, re-diagnosed and its taxonomic position corrected and established (Oláh *et al.* 2017). Examination of the species group character state of paramere fine structure as well as the speciation trait of paraproot of the three newly collected specimens, the taxonomic position in the *Drusus annulatus* species group and *Drusus annulatus* species complex was confirmed.

***Ecclisopteryx asterix* Malicky, 1979**

Material examined. Slovenia, Julian Alps, N. Vrsic Pass, Pišnica trib., nice spring, 1390 m, 46.4399N, 13.7538E, 22.V.2022, leg. G. Vinçon (2 males, 4 females; OPC). Slovenia, Julian Alps, E. Srednji Vrh, nice spring, 1060 m, 46.4952°N, 13.8518°E, 23.V.2022, leg. G. Vinçon (2 males, 3 females; OPC).

Limnephilinae Kolenati, 1848

Limnephilini Kolenati, 1848

***Limnephilus affinis* Curtis, 1834**

Material examined. France, Hautes-Pyrénées, below Tourmalet Pass, between 1610 m, Garet torrent, 42.9063°N, 0.2115°E, and 1970m, 42.8987°N, 0.2024°E, 17.IV.2022, leg. G. Vinçon (1 male, OPC).

***Limnephilus auricula* Curtis, 1834**

Material examined. **Italy**, Molise, below Sant Angelo del Pesco, brooklet on calcareous substratum, 750 m, 41.882°N, 14.25°E, 19.V. 2022, leg. G. Vinçon (1 male, OPC). **Italy**, Molise, above Pescopennataro, Fonte della Gallina, nice springs and brooklets, 1420 m, 41.8547°N, 14.2932°E, 18.V.2022, leg. G. Vinçon (1 male, OPC).

***Limnephilus ignavus* McLachlan, 1865**

Material examined. **France**, Pyrénées-Orientales, below Pas de la Case, rec del Baladrar torrent, 1900m, 42.556°N, 1.768°E, 8.X.2022, leg. Gilles Vinçon (1 male, OPC).

Chaetopterygini Hagen, 1858

***Annitella pyrenaica* (Navas, 1930)**

Material examined. **France**, Ariège, Videssos, Videssos River at Mounicou, river with abundant aquatic vegetation, 1110 m, 42.70775° N, 1.4503°E, 8.X.2022, leg. Gilles Vinçon (2 males, OPC). **France**, Pyrénées-Orientales, below Pas de la Case, rec del Baladrar torrent, 1900m, 42.556° N, 1.768°E, 8.X.2022, leg. Gilles Vinçon (4 males, 2 females; OPC). **France**, Pyrénées-Orientales, Puigmal Massif, Ribera d'Err, lateral spring, 2140m, 42.3855°N, 2.0926°E, 7.X.2022, leg. Gilles Vinçon (3 males, 2 females; OPC). **France**, Pyrénées-Orientales, Puigmal Massif, Ribera d'Err, lateral spring, 2140m, 42.3855°N, 2.0926° E, 7.X.2022, leg. Gilles Vinçon (3 males, 4 females; OPC). **France**, Pyrénées-Orientales, below Pas de la Case, rec del Baladrar torrent, nice brook and lateral springs, 2170m, 42.5426° N, 1.76°E, 8.X. 2022, leg. Gilles Vinçon (5 males, 2 females; OPC). **France**, Pyrénées-Orientales, below Pas de la Case, rec del Baladrar torrent, nice lateral spring, 1990m, 42.55175°N, 1.76484°E, 8.X. 2022, leg. G. Vinçon (4 male, 3 females; OPC).

***Chaetopterygopsis maclachlani* Stein, 1874**

Material examined. **France**, Ariège, path to Arlu Lake, nice spring, 1650m, 42.8142°N,

1.438°E, 9.X.2022, leg. Gilles Vinçon (1 male, OPC). **France**, Pyrénées-Orientales, below Pas de la Case, rec del Baladrar torrent, brook and lateral springs, 2170m, 42.5426°N, 1.76°E, 8.X. 2022, leg. Gilles Vinçon (3 males, 2 females; OPC).

***Chaetopteryx cantabrica* Oláh & Vinçon, 2022**

(Figure 110) (Map 4)

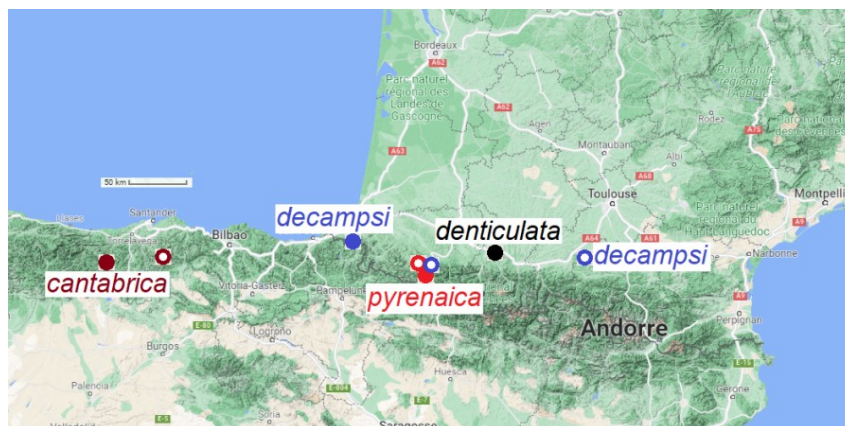
Material examined. **Spain**, Cantabria, San Roque de Riomiera, Portillo de Lunada, brook and spring below water catchment, 900m, 43.17°N, 3.686°W, 11.10.2022, leg. Gilles Vinçon (2 male, OPC). **Spain**, Burgos, Espinosa de los Monteros, Portillo de Las Estecas de Trueba, Nacimiento del Rio Trueba, brook and spring, 1140m, 43.114°N, 3.7021°W, 11.X.2022, leg. Gilles Vinçon (1 male, 1 female in copula, OPC).

Description of male. *Chaetopteryx cantabrica* Oláh & Vinçon, 2022 was described from a female holotype. We were lucky to collect three males of this sibling species in the *Chaetopteryx gonospina* species complex. Siblings in this small species complex indicate pronounced divergences in the female genital structures. The periphallallic organs of the male genitalia are rather stable without any discernible divergences. The parameres of the phallic organ seem to be the speciation trait exhibiting subtle, but stable divergences. The paramere shaft of the *Chaetopteryx cantabrica* male is straight, not curving as much as the shaft of the two other species. As well as the apicolateral spine row is shorter than at *C. gonospina* and the terminal S-curving is less pronounced than at *C. pyrenaica*.

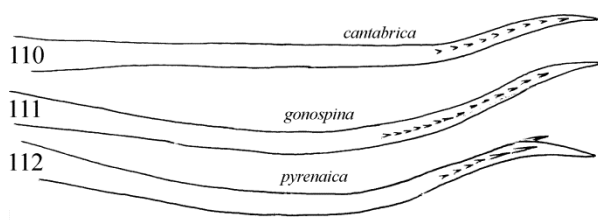
***Chaetopteryx decampsi* Oláh & Vinçon, 2022**

(Map 4)

Material examined. **France**, Pyrénées-Atlantiques, Osse-en-Aspe, road to Labays Pass, nice spring, 670m, 43.0177°N, 0.69°W, 10.X. 2022, leg. Gilles Vinçon (5 females, OPC). **France**, Pyrénées-Atlantiques, Osse-en-Aspe, before Oueils d'Issaux, nice resurgence, 680m, 43.00655°N, 0.6913°W, 10.X.2022, leg. Gilles Vinçon (1 male, OPC).



Map 4 Distribution of the *Chaetopteryx gonospina* siblings in the Pyrenees and Cantabrian Cordillera (full circles represent the type localities).



Figures 110–112. Lateral profile of the parameres in the *Chaetopteryx gonospina* species complex. 110 = *Chaetopteryx cantabrica* Oláh & Vinçon, 2022, 111 = *Chaetopteryx gonospina* Marinković, 1966, 112 = *Chaetopteryx pyrenaica* Oláh & Vinçon, 2022.

Remark. In the Aspe Valley (surroundings of Oueils d’Issaux) both siblings *C. decampsi* Oláh & Vinçon, 2022 and *C. pyrenaica* Oláh & Vinçon, 2022 are sympatric (Map 4).

Chaetopteryx lusitanica Malicky, 1974

Material examined. **Spain**, Asturias, Somiedo, La Peral, brook and nice spring, from 1310m, 43.0409°N, 6.2519°W, to 1410m, 43.039°N, 6.2555°W, 13.X.2022, leg. Gilles Vinçon (1 male, OPC). **Spain**, Leon, NE Aralla de Luna, nice brook, 1370m, 42.909°N, 5.8274°W, 14.X.2022, leg. Gilles Vinçon (1 male, OPC). **Spain**, Leon, Puerto de Leitariegos, nice spring, 1480m, 42.9837°N, 6.409°W, 13.X.2022, leg. Gilles Vinçon (2 males, 3 females; OPC). **Spain**, Cantabria, Puerto del Ponton, Fuente del Infierno, brook and spring, 1260m, 43.1023°N, 5.0303°W, 12.X.2022, leg. G. Vinçon (1 male, OPC).

Chaetopteryx tomaszewski Moretti, 1991

Material examined. **France**, Alpes-de-Haute-Provence, N.W. La Bâtie, Couissine brook and lateral spring, 1000 m, 43.8172°N, 6.5943°E, 5.I.2022, leg. G. Vinçon (1 male, 1 female; OPC). **France**, Alpes-de-Haute-Provence, Above Castellane, Lecques Pass, brook, 1220 m, 43.875°N, 6.464°E, 5.I.2022, leg. G. Vinçon (1 male, 1 female; OPC).

Remarks. Apicomeresal process on the aedeagus is more blunt compared to populations from Toscana, Italy as well as from Alpes-Maritimes, France. The single male specimen collected from the same habitat in 23.X.2021 by G. Vinçon exhibited similar divergences from the populations of locus typicus. It is possible that populations from Alpes-de-Haute-Provence may represent a distinct new sibling species. However, more specimens are required to examine the stability of this speciation trait splitting siblings in the *Chaetopteryx gessneri* species complex. This species is new for the French Fauna.

Chaetopteryx villosa (Fabricius, 1798)

Material examined. **France**, Pyrénées-Atlantiques, Osse-en-Aspe, Oueils d’Issaux, nice resurgence, 720m, 43.0045°N, 0.693°W, 10.X.2022, leg. Gilles Vinçon (1 male, OPC). **France**, Pyrénées-Atlantiques, Iraty, resurgence, 1100m,

43.0451°N, 1.0546°W, 10.X.2022, leg. Gilles Vinçon (1 female, OPC). France, Pyrénées-Orientales, Canigou Massif, Prats-de-Mollo-la-Preste, brook and spring, 1740m, 42.4459°N, 2.4155°E, 15.X.2022, leg. Gilles Vinçon (2 males, 2 females; OPC). France, Ariège, Vicdessos, Las Rougos, Pla de l'Izard, Mounicou tributary, spring and brook, 1220m, 42.6956°N, 1.451°E, 8.X.2022, leg. Gilles Vinçon (9 males, OPC). France, Pyrénées-Orientales, Canigou Massif, above Py, Rotja tributary, 1530m, lateral spring, 42.48375°N, 2.3246°E, 7.X.2022, leg. Gilles Vinçon (8 males, OPC). France, Ariège, Vicdessos, Videssos River at Mounicou, nice river with abundant aquatic vegetation, 1110 m, 42.70775°N, 1.4503°E, 8.X.2022, leg. Gilles Vinçon (4 males, 2 females; OPC). France, Pyrénées-Orientales, below Pas de la Case, rec del Baladrar torrent, 1900m, 42.556°N, 1.768°E, 8.X.2022, leg. Gilles Vinçon (14 males, 4 females; OPC). France, Pyrénées-Orientales, Canigou Massif, Prats-de-Mollo-la-Preste, brooklet and spring, 1860m, 42.4523°N, 2.4102°E, 15.X.2022, leg. Gilles Vinçon (4 males, 2 females; OPC). France, Haute-Garonne, Bagnère-de-Luchon, Pique Valley above Hospice de France, Pique spring, 1450m, 42.7168°N, 0.6536°E, 9.X.2022, leg. Gilles Vinçon (14 males, 6 females; OPC). France, Pyrénées-Orientales, below Pas de la Case, rec del Baladrar torrent, nice brook and lateral springs, 2170m, 42.5426°N, 1.76°E, 8.X.2022, leg. Gilles Vinçon (5 males, 2 females; OPC). France, Pyrénées-Orientales, Canigou Massif, above Py, Rotja tributary, 1530m, nice brook, 42.4838°N, 2.3245°E, 7.X.2022, leg. G. Vinçon (3 males 2 females; OPC). **Spain**, Burgos, Espinosa de los Monteros, Portillo de Las Estecas de Trueba, Fuente Cornejo, spring, 1030m, 43.1115°N, 3.6786°W, 11.X.2022, leg. Gilles Vinçon (1 male, OPC).

Stenophylacini Schmid, 1955

***Allogamus brauerii* (Kolenati, 1859)**

Material examined. France, Pyrénées-Orientales, below Pas de la Case, rec del Baladrar torrent, nice brook and lateral springs, 2170m,

42.5426°N, 1.76°E, 8.X.2022, leg. Gilles Vinçon (2 males, OPC).

***Allogamus fuesunae* Malicky, 2004**

Material examined. France, Pyrénées-Orientales, below Pas de la Case, rec del Baladrar torrent, nice brook and lateral springs, 2170m, 42.5426°N, 1.76°E, 8.X.2022, leg. Gilles Vinçon (1 male, OPC).

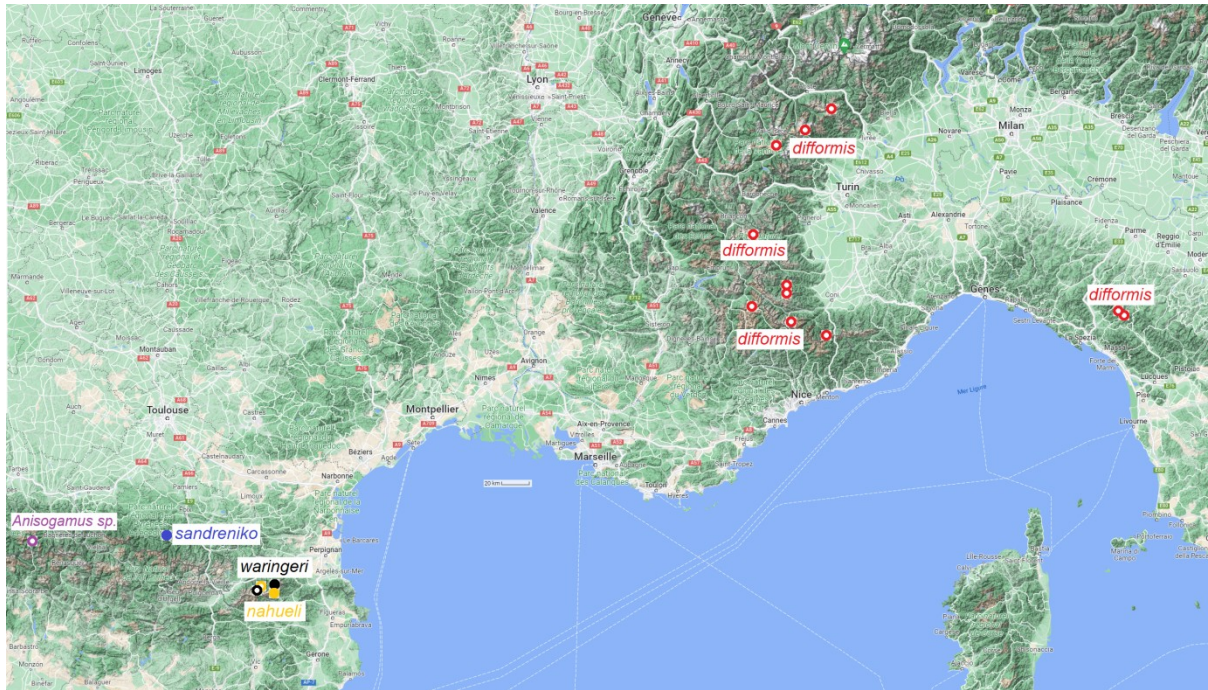
***Allogamus laureatus* (Navas, 1918)**

Material examined. **Spain**, Asturias, Puerto de Leitariegos, Brañas de Arriba, nice spring, 1400m, 43.0128°N, 6.4451°W, 13.X.2022, leg. Gilles Vinçon (1 male, 3 females; OPC).

Anisogamus McLachlan, 1874

(Map 5)

In the original genus description *Anisogamus* was placed close to *Stenophylax* (McLachlan, 1874, 1875). Schmid (1955) related it to *Potamophylax*. The following genital character state combination for the *Anisogamus* genus was elaborated in a lineage sorting study on the entire Limnephilinae subfamily (Oláh *et al.* 2019) (1) Presence (apomorphic) of spinulose protuberance on tergite VIII; (2) Reduced (apomorphic) state of tergite IX; (3) Setose inerm (plesiomorphic) state of cerci without sclerotic enforcement; (4) Produced (plesiomorphic) 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. This character state combination was based on the taxonomy of the type species *Anisogamus difformis* (McLachlan, 1867) but valid also for its sibling species *A. waringeri* Graf & Vitecek, 2015 and *A. nahueli* sp. nov. Discovering in France (see below: Pyrenean Ariège), a rather modified lineage in the *Anisogamus* genus and describing here as *Anisogamus sandreniko* sp.



Map 5 Distribution of the *Anisogamus* genus in the western Alps, northern Apennines and eastern Pyrenees (full circles represent the type localities).

nov. has modified significantly the character state combination of the *Anisogamus* genus. In the new lineage the tergite IX is not reduced, rather produced and the dorsal branch of the paraproct is vestigial, indiscernible, almost disappeared.

Paramere organisation proved to be the single speciation trait separating it to the three sibling species of the genus. The paramere of the phallic organ is a pair of simple spine-like, spiniform rods with upward turning apical portion; paramere surface is glabrous; the subapical region has corrugated-striated surface; the very tip of the paramere glabrous again without corrugations. The paramere of the new lineage has the same spine-like architecture, but more stout and with bifid apical head.

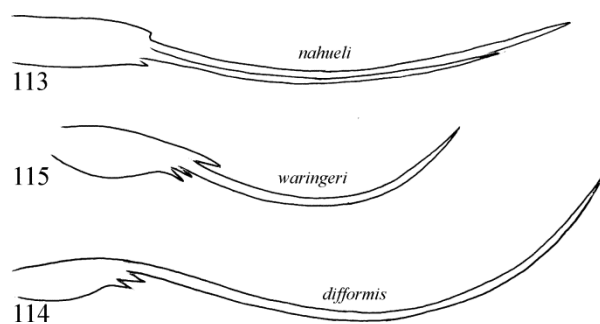
Remarks. The type species *A. difformis* populates crenal and epirhithral alpine habitats and of the Alps and was recently collected in Toscana (Oláh *et al.* 2022). A sibling species, *A. waringeri* Graf & Vitecek, was described (Graf *et al.* 2015) from the Pyrenees with well-defined divergences

in the paramere organisation. The paramere of *A. waringeri* is shorter and supplied with dorsomesal tine on the apical ending of the basal bulbous part lacking at *A. difformis*. One of the tiny ventral tines of *A. difformis* has developed into a long spine at *Anisogamus nahueli* sp. nov. The variability/stability of paramere divergences was not examined comparatively in details due to lack of adequate number of specimens. We have found stable fine structures on the parameres at all of the examined specimens of *A. difformis*, well discernible paramere asymmetry among the 9 specimens of *A. nahueli* sp. nov. as well as stable bifid paramere head at all of the 12 paratypes of *A. sandreniko* sp. nov.

***Anisogamus difformis* (McLachlan, 1867)**

(Figure 114) (Map 5)

Material examined. **Italy**, Piedmont, above Limonetto, < Lago dell Abisso, spring, 2200m, 44.1398°N, 7.5186°E, 16.VII.2022, leg. G. Vinçon (7 males, 4 females; OPC).



Figures 113–115. Lateral profile of the parameres in the *Anisogamus* genus. 113 = *A. nahueli* sp. nov., 114 = *A. difformis* (McLachlan, 1867) 115 = *A. waringeri* Graf & Vitecek, 2015.

***Anisogamus nahueli* sp. nov.**

(Figure 113) (Map 5) (Photos 10, 11)

Material examined. Holotype: **France**, Pyrénées-Orientales, Canigou Massif, Prats-de-Mollo-la-Preste, nice brook and spring, 1860 m, 42.4523°N, 2.4102°E, 30.IV.2022, leg. G. Vinçon (1 male, OPC). Paratypes: same as holotype (7 males, OPC). France, Pyrénées-Orientales, Canigou Massif, above Mantet, Rotja tributary, 1850 m, nice big spring, 42.4755N, 2.325E, 14.IV.2022, leg. G. Vinçon (1 male, 1 female; OPC).

Diagnosis. It was a great surprise to discover this unique species on both slopes of the Canigou Massif, not far from the locus typicus of *Anisogamus waringeri* located on the northern slope of the same mountain range. Actually, we have found more divergences (Figures 108–110) between *A. nahueli* sp. nov. living nearby to *A. waringeri* and the other two species *A. difformis*, *A. waringeri* than between *A. difformis* and *A. waringeri* living far from each other's due probably to character displacement in reinforcement processes of speciation. Strictly speaking there are no real differences in the structure of the periphallidic organs between the three species of this small genus, except perhaps the apical length of the gonopods. The difference between *A. difformis* and *A. waringeri* is almost limited to the presence of the single tiny tine on the apicodorsal region of the paramere basement, beside the abbreviation of the entire paramere of *A. waringeri*.

This subtle divergence seems to be stable at least our discovery of *A. waringeri* in a new habitat (see below) confirms the stability of this small character state divergence. However, there are more distinct, definite divergence in the structure of the parameres of the new species, *Anisogamus nahueli* sp. nov. In the new species one of the short tiny ventral tines is developed into a long secondary spine. However, examining the 12 paratypes there is a pronounced paramere asymmetry in the length of the long secondary spine.

Description. Similarly both to *Anisogamus difformis* (McLachlan, 1867) and *A. waringeri* Graf & Vitecek, 2015, this new species has yellow, fawn ochraceous colour. The basic architecture of the genitalia is almost identical to the above listed two species. Apical region of the gonopods appears similar to *A. waringeri*, a little longer and more slender than *A. difformis*. The paramere has unique structure; the spine-like paramere shaft is almost doubled. The main shaft is accompanied by a long spine, little shorter than the main paramere shaft with a tendency to paramere asymmetry as well as with a certain range of variation in the length of the second spine.

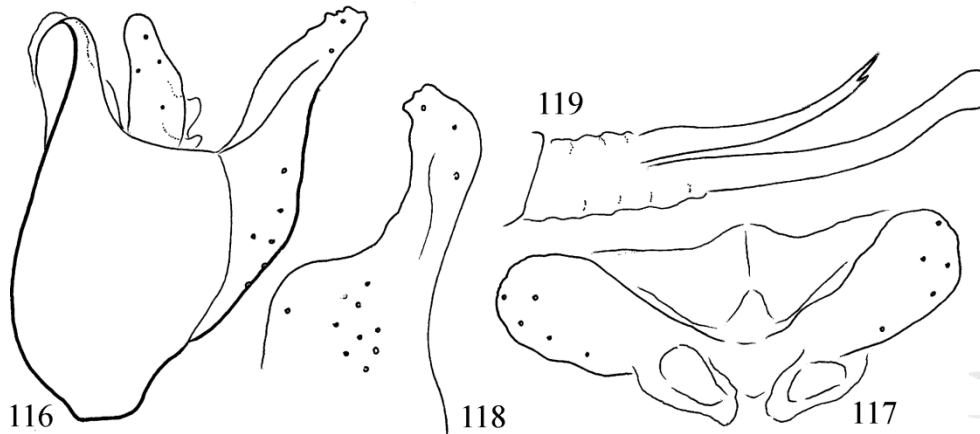
Etymology. This species was dedicated to Nahuel, newly born grandson of the collector Gilles Vinçon, son of Amélia Vinçon.

***Anisogamus sandreniko* sp. nov.**

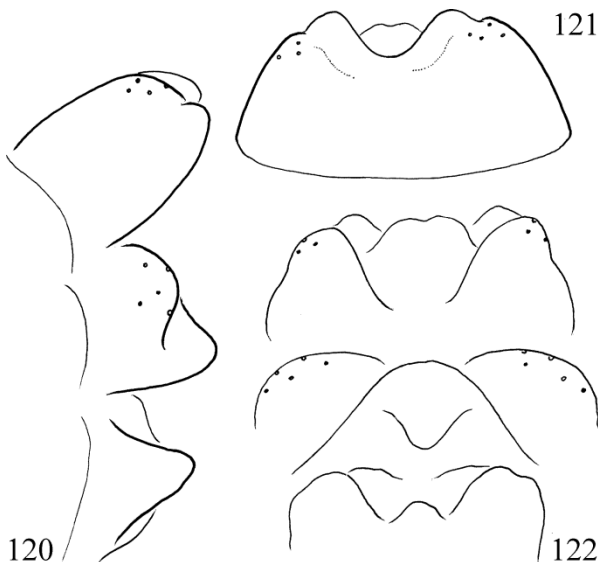
(Figures 116–122) (Map 5) (Photos 1, 2)

Material examined. Holotype: **France**, Ariège, path to Arlu Lake, nice spring, 1650m, 42.8142° N, 1.438°E, 9.X.2022, leg. Gilles Vinçon (1 male, OPC). Allotype: same as holotype (1 female, OPC). Paratypes: same as holotype (12 males, 2 females; OPC).

Diagnosis. The known members of the genus *Anisogamus* have very conservative genital structure. Especially the periphallidic organs are stable. Speciation is realised by subtle divergences of the paramere. The new species of



Figures 116–119. *Anisogamus sandreniko* sp. nov. Holotype male: 116 = genitalia in lateral view; 117 = Cerci with the ventral arm of paraproct and the dorsum of segment IX in caudal view; 118 = left gonopod in ventral view; 119 = phallic organ in lateral view.



Figures 120–122. *Anisogamus sandreniko* sp. nov. Allotype female: 120 = genitalia in lateral view; 121 = genitalia in dorsal view; 122 = genitalia in ventral view.

Anisogamus sandreniko is a highly modified taxon. Dorsum of segment IX produced, dorsal arm of paraproct lost and the gonopods modified. Such a great change in the genitalia is considered to occur on genus level of lineages. However, we retain this new lineage in the *Anisogamus* genus because of the unchanged habitus of the male and particularly because of the unmodified female. The modification is restricted to male genital

structure as well as to the reduced male spur number of 034.

Description. Similarly to all *Anisogamus* species, this new highly modified species has preserved the typical yellow, fawn ochraceous colour as well as the pronounced sexual dimorphism of female brachyptery, but the spur formula has been reduced from 134 to 034 at the male, but preserved 134 at the female. The character state combination of the genital architecture is highly modified having the dorsal arm of the paraproct reduced, vestigial; it is almost completely disappeared. Dorsum of segment IX produced. Gonopods elongated enforced, particularly their apical region highly sclerotized and dentate.

Etymology. This unique, highly modified *Anisogamus* species or a possible representative of a new genus was dedicated to the granddaughters of the first author. The name was coined from their names Sandra and Enikő, as a noun in apposition: *sandreniko*.

***Anisogamus waringeri* Graf & Vitecek, 2015**

(Figure 115) (Map 5) (Photo 11)

Material examined. **France**, Pyrénées-Orientales, Canigou Massif, above Mantet Pass, Rotja

tributary, 1850m, big spring, 42.4755°N, 2.325°E, 7.X.2022, leg. Gilles Vinçon (1 male, OPC).

***Consorophylax kimera* (Oláh & Vinçon, 2021)**

(Map 6)

Material examined. **France**, Pyrénées-Orientales, Puigmal Massif, Ribera d'Err, 1900–2200 m, 42.3855°N, 2.0926°E, 14.IV.2022, leg. G. Vinçon (22 males, 3 females; OPC). **Italy**, Piemonte, Pennines Alps, high Sesia Valley, above Sant' Antonio, big spring below Lago Nero, 2630 m, 45.814°N, 7.88°E, 26.V.2022, leg. G. Vinçon (1 male, 4 females; OPC). Italy, Aosta Valley, High Ayas Valley, above St Jacques, near 'Alpe Mase', nice spring, 2400 m, 45.8929°N, 7.7039°E, 11.VI.2022, leg. G. Vinçon (1 female, OPC). **Italy**, Dolomiti, S.E. Moso, Parco Naturale Tre Cime, many springs below water captures, trib. Rio Bianco, 1650 m, 46.6557°N, 12.4062°E, 24.V.2022, leg. Gilles Vinçon (8 males, 4 females; OPC). Italy, Rhaetian Alps, Livigno, N. slope of Passo del Foscagno, brook and spring, 2270 m, 46.4979°N, 10.2051°E, 25.V.2022, leg. G. Vinçon (1 male, OPC).

Remarks. This species was only known from the Italian Alps. It is new for France and also the

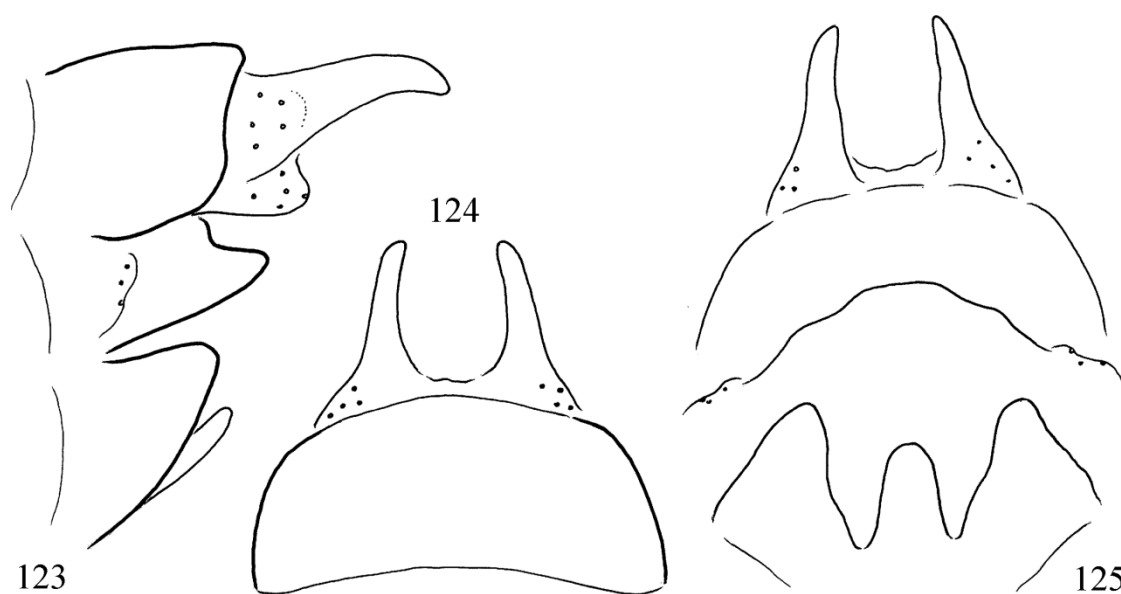
first mention of the genus *Consorophylax* in the Pyrenees (Map 6). The general tendency for brachyptery is lacking at specimens from the Dolomiti.

***Consorophylax vellach* sp. nov.**

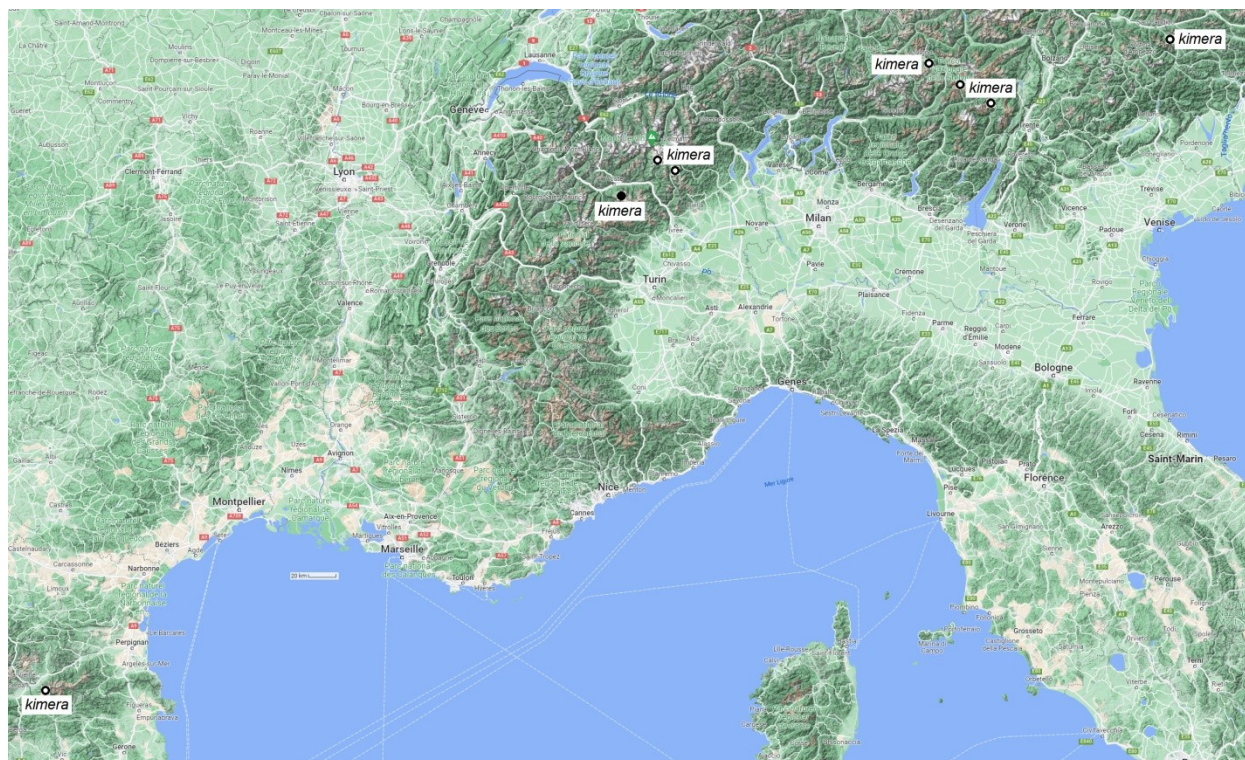
(Figures 123–125) (Photos 12, 13)

Material examined. Holotype: **Austria**, Kärnten, S. Bad Vellach, Vrnik-Quelle, spring, 1380 m, 46.4214°N, 14.5723°E and brook, 1060 m, 46.4192N, 14.5607E, 22.V.2022, leg. G. Vinçon (1 female, OPC).

Diagnosis. This new species in the *Consorophylax* genus is described by a single beautiful female with remarkably brown-banded and light-spotted forewing. Its genital structure is diverged from all the female genitalia known in the genus (*cairos*, *carinthiacus*, *consors*, *juliae*, *kimera*, *lagoverde*, *montivagus*, *seolan*, *styriacus*, *vinconi*) by the extremely elongated digitiform lobes with downward turning apices on segment X and the males without known females are not banded and not spotted on forewing conspicuously (*corvo*, *delmastroi*, *lepontiorum*, *livek*, *piemontanus*).



Figures 123–125. *Consorophylax vellach* sp. nov. Holotype female: 123 = genitalia in lateral view; 124 = genitalia in dorsal view; 125 = genitalia in ventral view.



Map 6. Distribution of *Consorophylax kimera* in the Alps and eastern Pyrenees (full circles represent the type localities).

Description. Female (in alcohol). This is a brown species with light brown cephalic and thoracic sclerites and with variously lighter appendages. Forewing with strong, erect spine-like setae on the longitudinal veins; membrane mostly covered with tiny recumbent setae; forewing length 9 mm. Forewing is broad and beautifully patterned. Most of the longitudinal veins accompanied with darker brown band; bands are less pronounced along R1 and anal veins. Forewing membrane is remarkably light-spotted with spot-size of around the cell-size. Tibial spur number 134.

Female genitalia. Female genitalia is characterized with elongated two parted anal tube, formed by the complex of the fused tergite IX and segment X, basal part is almost quadrangular in dorsal view and the apical part is composed of two slender digitiform and elongated lateral lobes. Sternite IX is without true setal surface like at other member of this genus, but this new species retained some area with a few setae; the mesal

plate with ventral lobe as visible in lateral view; it is rounded in ventral view; this usually glabrous ventral surface of sternite IX functions like the upper vaginal lip present as a free supragenital plate. The lower vaginal lip, the vulvar scale is visible somewhat separated from sternite VIII by its more sclerotized structure; the mesal lobe is shorter than the lateral lobes.

Etymology. Coined after the name of the Locus Typicus, a noun in apposition.

Enoicyla pusilla (Burmeister, 1839)

Material examined. **France**, Ariège, Vicedessos, Videssos River at Mounicou, nice river with abundant aquatic vegetation, 1110 m, 42.70775° N, 1.4503°E, 8.X0.2022, leg. Gilles Vinçon (1 male, OPC). **Spain**, Asturias, Puerto de Tarna, brook and springs, from 1130m, 43.1095°N, 5.2188°W, to 1220m, 43.1073°N, 5.2159°W, 12. X.2022, leg. Gilles Vinçon (1 male, OPC). Spain, Asturias, Somiedo, La Peral, brook and nice

spring, from 1310m, 43.0409°N, 6.2519°W, to 1410m, 43.039°N, 6.2555°W, 13.X.2022, leg. Gilles Vinçon (1 male, OPC). Spain, Asturias, Somiedo, La Peral, brook and nice spring, 1360m, 43.0384°N, 6.2499°W, 13.X.2022, leg. Gilles Vinçon (2 males, OPC). Spain, Leon, NE Aralla de Luna, nice brook, 1370m, 42.909°N, 5.8274°W, 14.X.2022, leg. Gilles Vinçon (1 male, OPC). Spain, Asturias, Puerto del Palo Allande, brook and spring, from 950m, 43.2778°N, 6.6681°W, up to 1000m, 43.2764°N, 6.6725°W, 13.X.2022, leg. Gilles Vinçon (1 male, OPC).

***Halesus rubricollis* (Pictet, 1834)**

Material examined. **France**, Alpes-de-Haute-Provence, Laverq Valley, brook, 2230 m, 44.305°N, 6.5136°E, 16.VII.2022, leg. G. Vinçon (1 male, OPC).

***Parachiona picicornis*, Pictet, 1834**

Material examined. **Slovenia**, Julian Alps, S. Vrsic Pass, Minarica trib., nice spring, 1300 m, 46.4113°N, 13.7515°E, 21.V.2022, leg. G. Vinçon (1 male, OPC).

***Potamophylax albergaria* Malicky, 1976**

Material examined. **Spain**, Asturias, North Pola de Allande, nice springs, 750m, 43.2862°N, 6.6136°W, 13.X.2022, leg. Gilles Vinçon (1 male, OPC). Spain, Asturias, Puerto del Palo Allande, brook and spring, from 950m, 43.2778°N, 6.6681°W, up to 1000m, 43.2764°N, 6.6725°W, 13.X.2022, leg. Gilles Vinçon (6 males, OPC).

***Potamophylax asturicus* Martínez, Martín & González, 2016**

Material examined. **Spain**, Asturias, Puerto de Tarna, brook and springs, from 1130m, 43.1095°N, 5.2188°W, to 1220m, 43.1073°N, 5.2159°W, 12.X.2022, leg. Gilles Vinçon (1 male, OPC).

***Potamophylax inermis* Moretti & Cianficconi, 1994**

Material examined. **Italy**, Marches, Parco Nazionale dei Monti Sibillini, Panico Valley, nice

brook and spring, 1180 m, 42.945°N, 13.1995°E, 18.V.2022, leg. G. Vinçon (3 males, 5 females, OPC).

***Simaphylax andorricus* Oláh & Vinçon, 2022**

Material examined. **France**, Pyrénées-Orientales, Puigmal Massif, Ribera d'Err, brook and spring, 2380m, 42.3882°N, 2.105°E, 7.X.2022, leg. Gilles Vinçon (1 male, OPC). France, Pyrénées-Orientales, Puigmal Massif, Ribera d'Err, lateral spring, 2140m, 42.3855°N, 2.0926°E, 7.X.2022, leg. Gilles Vinçon (8 males, 2 females; OPC).

***Simaphylax ariegeus* Oláh & Vinçon, 2022**

Material examined. **France**, Pyrénées-Orientales, below Pas de la Case, rec del Baladrar torrent, 1900m, 42.556°N, 1.768°E, 8.X.2022, leg. Gilles Vinçon (3 males, 1 female; OPC). France, Pyrénées-Orientales, below Pas de la Case, rec del Baladrar torrent, nice brook and lateral springs, 2170m, 42.5426°N, 1.76°E, 8.X.2022, leg. Gilles Vinçon (5 males, 2 females; OPC). France, Pyrénées-Orientales, below Pas de la Case, rec del Baladrar torrent, nice brook and lateral springs, 2170m, 42.5426°N, 1.76°E, 8.X.2022, leg. Gilles Vinçon (12 males, 3 females; OPC). France, Pyrénées-Orientales, Canigou Massif, above Py, Rotja tributary, 1530m, nice brook, 42.4838°N, 2.3245°E, 7.X.2022, leg. G. Vinçon (1 male, 5 females; OPC). France, Pyrénées-Orientales, below Pas de la Case, rec del Baladrar torrent, nice lateral spring, 1990m, 42.55175°N, 1.76484°E, 8.X.2022, leg. G. Vinçon (6 male, 5 females; OPC).

***Simaphylax orientalopyrenaicus* (Coppa, 2017)**

Material examined. **France**, Pyrénées-Orientales, Canigou Massif, above Mantet Pass, Rotja tributary, 1870m, brook and spring, 42.4765°N, 2.3223°E, 7.X.2022, leg. Gilles Vinçon (1 male, OPC). France, Pyrénées-Orientales, Canigou Massif, Prats-de-Mollo-la-Preste, brook and spring, 1630m, 42.4348°N, 2.394°E, 15.X.2022, leg. G. Vinçon (1 male, 1 female, OPC).



Map 7. Distribution of the *Sericostoma flavicorne* group in Anatolia and Lebanon (full circles represent the type localities).

***Stenophylax permistus* McLachlan, 1895**

Material examined. **Italy**, Ligurian Apennines, above Rocca d'Aveto, nice brook and spring, 1400 m, 44.555N, 9.4767E, 15.V.2022, leg. G. Vinçon (1 male, 1 female, OPC).

Odontoceridae

***Odontocerum albicorne* (Scopoli, 1763)**

Material examined. **France**, Isère, Taillefer Massif, below Brouffier lake, spring Guiliman tributary, 2050 m, 45.0355°N, 5.8861°E, 21.VII.2022, leg. G. Vinçon (1 male, OPC). **Italy**, Molise, Castel San Vincenzo, River Volturno, 530 m, 41.654°N, 14.077°E, 19.V.2022, leg. G. Vinçon (6 males, 3 females; OPC).

Leptoceridae Leach, 1815

***Adicella meridionalis* Morton, 1906**

Material examined. **Portugal**, Serra da Estrela Massif, North Valezim, nice spring, 650 m,

40.3718°N, 7.713°W, 23.IV.2022, leg. G. Vinçon (1 male, OPC).

***Adicella reducta* (McLachlan, 1865)**

Material examined. **Spain**, Castilla y Leon, Sierra de Candelario, Rio Becedillas at Becedas, 1110 m, 40.4013°N, 5.6371°W, 23.IV.2022, leg. G. Vinçon (1 male, OPC).

Beraeidae Wallengren, 1891

***Beraea dira* McLachlan, 1875**

Material examined. **Italy**, Julian Pre-Alps, road to Cepletischis, nice springs and seeping rocks, 340 m, 46.1701N, 13.5581E and 46.1703N, 13.5575E, 21.V.2022, leg. G. Vinçon (1 male, OPC).

Sericostomatidae Stephens, 1836

***Sericostoma* Latreille, 1825**

Sericostoma genus is considered from the very beginning (McLachlan, 1874-1880), until recently

(Malicky 2005), as one of the most difficult taxon among caddisflies. The discrimination or delineation of species in this genus presented unusual and grave difficulties, sometimes of artificial construct, wasteful byproduct of science, overly created by human limitations, including our hubristic and apophantic attitudes. Here, applying the paraproct as a speciation trait we delineate and specify each species lineages of the genus. However, in this survey we do not revise unsettled synonymies and poorly known species, instead we establish species groups and produce the lateral profile of the paraproct speciation traits for each species considered or proved to be valid with distinct and stable divergences in pure populations and taking into consideration the intermediate forms of the incipient sibling species under reinforcement with standing genetic variations and incomplete lineage sorting.

Having monotonous morphological characters, the present delineation of species in the *Sericostoma* genus is mainly, if not completely, based on the form of spines on segment X (Moretti & Cianficconi, 1978; Botosaneanu, 2000) that is on the shape of the paraproct and usually drawn and compared in lateral view. Already McLachlan (1876) considered that the superior and inferior appendages, the penis, the ventral process, and even the ventral triangle, do not, in most cases, furnish any good and safe characters, and there rest only the penis-sheaths, which do in many cases provide very satisfactory characters. According to McLachlan the penis-sheaths (paraproct), one of the primary sexual traits, are the most salient character in the *Sericostoma* genus. Corneous testaceous sheaths, shorter than the penis, and usually furcate or lanceolate at their tips (varying in form according to the species).

Species are separated both by reproductive isolation and by non-sexual differences in morphology and behaviour. Sexual mechanism is a fundamental function dominating in any kind of life beings. Environmental and sexual integration of any new species is a complex, interactive organisation. Male genitalia diverge more rapidly

than any other morphological traits. Rapidly diverging primary sexual traits suggest directly and empirically that speciation is initiated, driven and completed more by sexual organisation (sexual selection according to the Darwinist) and less by adaptive organisation (natural selection). The high diversity of paraproct is the direct, unquestionable indication of its central role in the sexual integration resulting in speciation processes mostly in allopatric isolation.

The speciation trait of the paraproct in the *Sericostoma* genus that are the lateral spiniform processes of segment X is not examined systematically for trait stability. Most species have rather peculiar shape divergence without creating any difficulties in species delineation. Only some species in the *Sericostoma personatum* and *S. vittatum* species complexes are experienced having rather wide range of variability in the lateral profile of the paraproct.

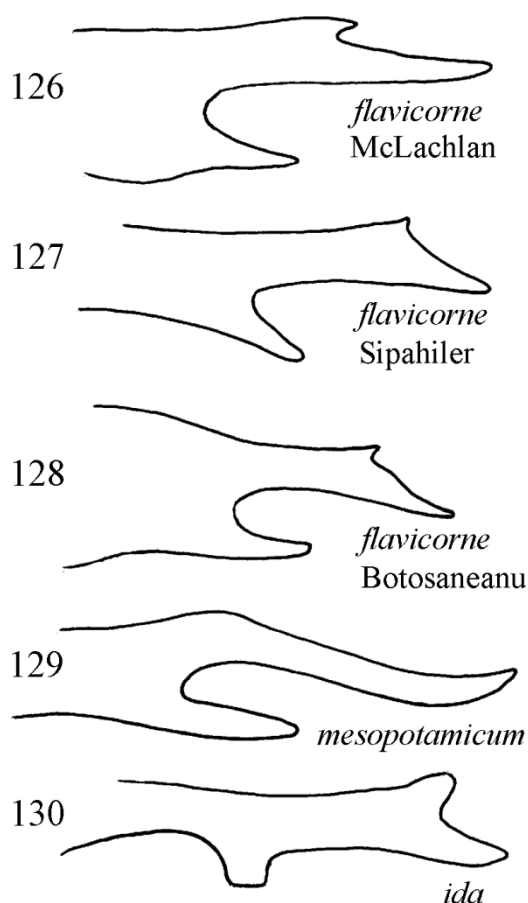
In practice, there are significant intermediate/intermediar paraproct shapes detected between species of *Sericostoma baeticum* and *S. vittatum* as well as between *S. pedemontanum* and *S. personatum*. However all the four species have very distinct and peculiar lateral profile of the paraproct in pure populations and the observed shape variations are typical sign of standing genetic variation and incomplete lineage sorting of incipient siblings, as well as suggesting speciation processes under reinforcement by character displacement either in primary or in secondary contact zones and along contact clines.

Moreover, the observed and drawn variations in the lateral profile of the paraproct are frequently produced by the observer due to lack of experience, inadequate observing angle and drawing style, prejudiced/biassed attitude or are the result of mating battles. In worn *Sericostoma* male the apical branches of the paraproct are frequently broken in various positions resulted in apparent, unusual bifid apices, distorted prongs, abbreviations or even the complete disappearance of either the dorsal or ventral branch.

Sericostoma flavicorne species group

(Figures 126–130) (Map 7)

A small species group of enlarged maxillary palp with very long dorsal and very short ventral branches on the apical region of the paraproct. The dorsal branch has some additional dorsal elevation. Three species belong to this complex distributed in Turkey and in the Levant: *Sericostoma flavicorne* Schneider, 1845; *Sericostoma ida* Sipahiler, 2000; *Sericostoma mesopotamicum* McLachlan, 1898. All the three species are well differentiated, and easy to delineate by the lateral profile of the paraproct.



Figures 126–130. Lateral profile of the paraproct in the *Sericostoma flavicorne* species group. 126 = *Sericostoma flavicorne*, McLachlan's drawing; 127 = *S. flavicorne* Sipahiler's drawing; 128 = *S. flavicorne* Botosaneanu's drawing; 129 = *S. mesopotamicum*; 130 = *S. ida*.

Sericostoma flavicorne Schneider, 1845

(Figures 126–128) (Map 7)

Sericostoma flavicorne Schneider, 1845:155. "♂ von Kellemisch (Turkey: Gelemis). Nigrum; palpis maxillaribus cochleiformibus."

Sericostoma flavicorne Schneider, 1845: McLachlan 1880: 48. "I have seen Schneider's type, now in Hagen's collection. The antennae have decided traces of dark annulations in their basal portion; nevertheless, I think it may be distinct from *schneideri*. ... the lower branch of the penis-sheaths is more considerably shorter than the upper, stouter and less contiguous."

Sericostoma flavicorne Schneider, 1845: McLachlan 1898:49. "examples in Albarda's collection (whereof he presented me with one ♂) from Beirut, Syria pertain here. The penis-sheaths show an approach towards a condition sometimes present in *S. personatum*. There now seems no reason to doubt its distinctness from *S. schneideri*." Excellent drawing is produced about the lateral profile of the apical region of the paraproct with short ventral branch and long dorsal branch; there is a pointed prong subapical on the dorsum of the dorsal branch.

Sericostoma flavicorne Schneider, 1845: Botosaneanu 1992: 266–267. "a distinct species probably present exclusively in Asia Minor and the Levant." The lateral profile of the paraproct apical region of four specimens from the Levant has exactly the same pattern as drawn by McLachlan (1898): short ventral branch, long dorsal branch with subapical dorsal prong.

Sericostoma flavicorne Schneider, 1845: Sipahiler 2000:23–24. Examination and drawings of newly collected specimens nearby to locus typicus in Turkey confirmed the structural pattern of the paraproct presented first by McLachlan (1898).

Sericostoma flavicorne Schneider, 1845: Botosaneanu 2001:518. "Schneider (1845: 155) described *Sericostoma flavicorne*, based on a ♂ specimen from a locality in SW Anatolia ("Kellemisch"; presently: Gelemis, a locality near the Mediterranean shores of Anatolia in one of the southernmost points, on a tributary of river Esen in its lower course)." "I could study the type specimen of *S. flavicorne* (from H. Hagen's collection; kept in the MZC)." The lateral profile of the paraproct apical region of the holotype from Turkey has exactly the same pattern as presented first by McLachlan (1898) from specimen collected in Beirut.

Diagnosis. Holotype paraproct: upper branch considerably longer than the small, spiniform lower branch, and always antepically bearing a short dorsal prong or point (Botosaneanu 2001).

Remarks. It was simply a prejudiced/biased attitude (Malicky 2005) to question the identity of *Sericostoma flavicorne* Schneider, 1845 and trouble the delineation between *S. flavicorne* and *S. schneideri* (Kolenati, 1848). Especially after published redrawings of type specimens of both species became available (Botosaneanu 2001). Not speaking about the long availability of the excellent drawings about the paraproct of the type specimen published already by McLachlan (1898). The same quality of excellent drawings was also available (McLachlan 1876, 1880) for the paraproct lateral profile of the other species *Sericostoma schneideri* (Kolenati, 1848). Difficult to understand why was any kind of questioning regarding the reliable delineation between *S. flavicorne* and *S. schneideri* having so different, clearly distinguishable paraproct structures.

***Sericostoma ida* Sipahiler, 2000**

(Figure 130) (Map 7)

Sericostoma ida Sipahiler, 2000:24–25. “This species was found in the Kazdag (Ida Mountains) in north-western Anatolia. Holotype male and paratypes (3 females): Turkey, Balikesir, 25 km east of Edremit, Güre-Zeytinli, Kazdaglari, 400 m, Ayi deresi, (39°40’N; 26°49’E), 7.VIII.1994.” “Closely related to *S. flavicorne* Schneider.”

***Sericostoma mesopotamicum* McLachlan, 1898**

(Figure 129) (Map 7)

Sericostoma mesopotamicum McLachlan, 1898: 49. “Maxillary palpi of ♂ very prominent. A very distinct form, in consequence of the great disproportion of the two branches of the penis sheaths.” “Mesopotamia (Malatia, 4♂, Albarda’s and my collection).”

Sericostoma mesopotamicum McLachlan, 1898: Botosaneanu 1992:266. “Mention should be made of *Sericostoma mesopotamicum* McLachlan, 1898; I shall not discuss the problem of its validity as a good species (this seems unlikely); the point is that

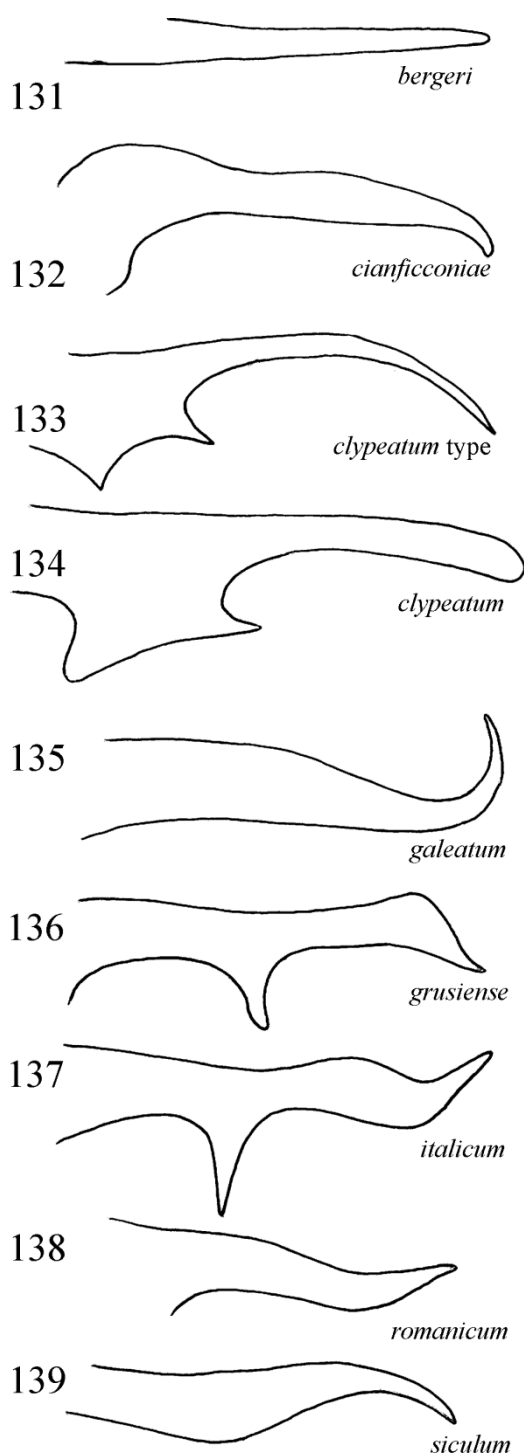
it was described from “Mesopotamia, Malatia”, but there is no Malatia in Mesopotamia (instead, there is one in Asia Minor, and a “Malatie” in Egypt).”

Sericostoma mesopotamicum McLachlan, 1898: Botosaneanu 2004:177. “McLachlan (1898) described and illustrated this species from a specimen caught in “Mesopotamia (Malatia)”; Malatia is in central-eastern Anatolia. No subsequent recording of *S. mesopotamicum* is known, and in Botosaneanu (1992:266) the opinion is expressed that this is unlikely a good species. Most to my surprise I have found in the Z.M.A. collections 4 males and 1 female of *S. mesopotamicum* sampled in Anatolia by Dutch entomologists and perfectly matching McLachlan’s description and illustration. The sampling data are as follows: 1 male “Nigde, 10 km S of Camardi, 1,300 m., 30.VI.1982, H. v. Oorschot & H. v. d. Brink”; 1 male “Sivas, Env. Gökpınar, 10 km S. of Gürün, 1,500-1,700 m, 30.VII.-2.VIII.1983, H. v. Oorschot, H. v. d. Brink & H. Wiering”; 2 males, 1 female “Hakkari, W. side and E. side Suvarihalil Gecidi, 1,900–2,250 m, 14.VI. 1985, H. v. Oorschot & H. v. d. Brink.”

***Sericostoma galeatum* species group**

(Figures 131–139) (Map 8)

This species group could be the putative ancestral group distributed more widely, represented also in the Caucasus. However, its paraproct is apomorphic, at least if we follow the principles “complex is plesiomorphic”. According to Williston (1914), Ross (1956) and Schmid (1979) structures tend toward reduction (Oláh *et al.* 2014). Species in the *Sericostoma galeatum* group have simple, lanceolate apical region that is narrow and tapering to a point, not furcate. There are eight species in this group with simple monolobed apical region. We simply list the members of this group with their taxonomic history and present their paraproct lateral profile to distinguish them easily in routine determination procedures: *Sericostoma bergeri* Malicky, 1973; *Sericostoma cianficconiae* Moretti, 1978; *Sericostoma clypeatum* Hagen, 1864; *Sericostoma galeatum* Rambur, 1842; *Sericostoma grusiense* Martynov, 1913; *Sericostoma italicum* Moretti, 1978; *Sericostoma romanicum* Navas, 1930; *Sericostoma siculum* McLachlan, 1876.



Figures 131–139. Lateral profile of the paraproct in the *Sericostoma galeatum* species group. 131 = *Sericostoma bergeri*; 132 = *S. cianficconiae*; 133 = holotype of *S. clypeatum*; 134 = putative new species from Corsica; 135 = *S. galeatum*; 136 = *S. grusiense*; 137 = *S. italicum*; 138 = *S. romanicum*; 139 = *S. siculum*.

***Sericostoma bergeri* Malicky, 1973**

(Figure 131) (Map 8)

Sericostoma bergeri Malicky, 1973:249–251. “Holotypus ♂, Allotypus ♀ und mehrere Paratypen: Graecia, Insel Andros, Andros, 27.V.1973. Weitere Paratypen: Insel Andros: Apikia, 29.V.1973. Alle in meiner Sammlung. Diese Art steht durch die Form der Seitenteile des 10. Segments, der unteren Anhänge und des Ventralteiles des 9. Segments innerhalb der Gattung isoliert.”

***Sericostoma cianficconiae* Moretti, 1978**

(Figure 132) (Map 8)

Sericostoma cianficconii Moretti, 1978:9. “This species was previously assigned, with reserve, by one of us (Moretti) to *S. siculum*, but the differences that emerged from a subsequent direct comparison with specimens belonging to *S. siculum* made it necessary to separate it from this species and to create a new one. It has been found in Emilia, Apuanian Mountains, the Marches and in Umbria” Unfortunately there is no holotype with locus typicus designated. The species description was accompanied with a note “The *S. cianficconii* and *S. italicum* species have already been described in a special paper, now being printed.” However this paper with holotype and locus typicus designation has not been printed. We are unable to map its exact locus typicus. Instead we map the approximate empirical centre of the distributional area suggested by listing the provinces where *S. cianficconiae* was collected.

Material examined. Italy, Calabria, Aspromonte, 2 nice brooklets separated by about 10 m, with mosses and dripping rocks, 38.25°N, 15.853°E, 850–900 m, 7.IX.2020, leg. Gilles Vinçon (2 males, OPC).

***Sericostoma clypeatum* Hagen, 1864**

(Figures 133–134) (Map 8)

Sericostoma clypeatum Hagen, 1864:43. “Névroptères de la Corse.” “Les intermédiaires aussi longs que les inférieurs, leur branche interne peu visible, tournée en bas, formant un crochet court au milieu des appendices intermédiaires, la branche externe très longue, en lame aplatie.”

Material examined. **France**, Corsica, Haute-Corse, Castifao, Ponte Carnispola, 274 m, 14.X.1999, leg. Salmini (1 male, 1 female; OPC).

Remarks. We have a single male identified as *Sericostoma clypeatum* Hagen, 1864 and presented to our collection by the Bergamo Museum. After clearing, cleaning and drawing the paraproct lateral profile we were surprised to recognise an entirely new taxon with the same basic paraproct architecture characterising the known species of Corsica, *Sericostoma clypeatum* but with significantly diverged substructures. It would be reasonable to re-examine the taxonomic status of the *Sericostoma* populations in Corsica in a comprehensive sampling programme. Malicky (2010) has separated two very closely related species in Sicily in a carefully planned and sampled study with less diverged substructures.

***Sericostoma galeatum* Rambur, 1842**

(Figure 135) (Map 8)

Sericostoma galeatum Rambur, 1842:95–96. “Habite le midi de la France. C’est probablement l’espèce qui a servi de type à Latreille pour la création de ce genre.”

***Sericostoma grusiense* Martynov, 1913**

(Figures 136) (Map 8)

Sericostoma grusiense Martynov, 1913:64–67. Translated from Russian: „6♂, 1♀, Forested stream at Baisubani near village Mihailovki, 19.VI.1919, (leg. A. Martynov).”Species close to *S. baeticum* Pict. and *S. vittatum* Ramb., especially to the first.

Material examined. Caucasus, Armenia, Alagez, Inaklju, 27.VII.1934 (1 male, 2 females; OPC).

***Sericostoma italicum* Moretti, 1978**

(Figure 137) (Map 8)

Sericostoma italicum Moretti, 1978:10–12. “The appendages of segment X, seen from above, appear to be convergent or crossed and the ventral teeth are

strong, robust, long, turned outwards and a little backwards.” It is found in a well defined and continuous area, namely Tuscany, and the Apuanian Mountains, Umbria, Latium, Abruzzo, Molise and Campania Unfortunately there is no holotype with locus typicus designated. The species description was accompanied with a note “The *S. cianficconii* and *S. italicum* species have already been described in a special paper, now being printed.” However this paper with holotype and locus typicus designation has not been printed. We are unable to map its exact locus typicus. Instead we map the approximate empirical centre of the distributional area suggested by listing the provinces where *S. italicum* was collected.

Material examined. **Italy**, Abruzzi, Prati di Mezzo, spring below the water capture, 41.651N, 13.959E, 1700m, 1.VII.2020, leg. Gilles Vinçon (22 males, 4 females; OPC). **Italy**, Molise, Castel San Vincenzo, Sorgente Acquaruolo, 470 m, 41.6594N, 14.0783E, 19.V.2022, leg. G. Vinçon (8 males, 1 female; OPC).

***Sericostoma romanicum* Navas, 1930**

(Figure 138) (Map 8)

Sericostoma romanicum Navas, 1930: 149–151. Italy, Emilia Romagna.

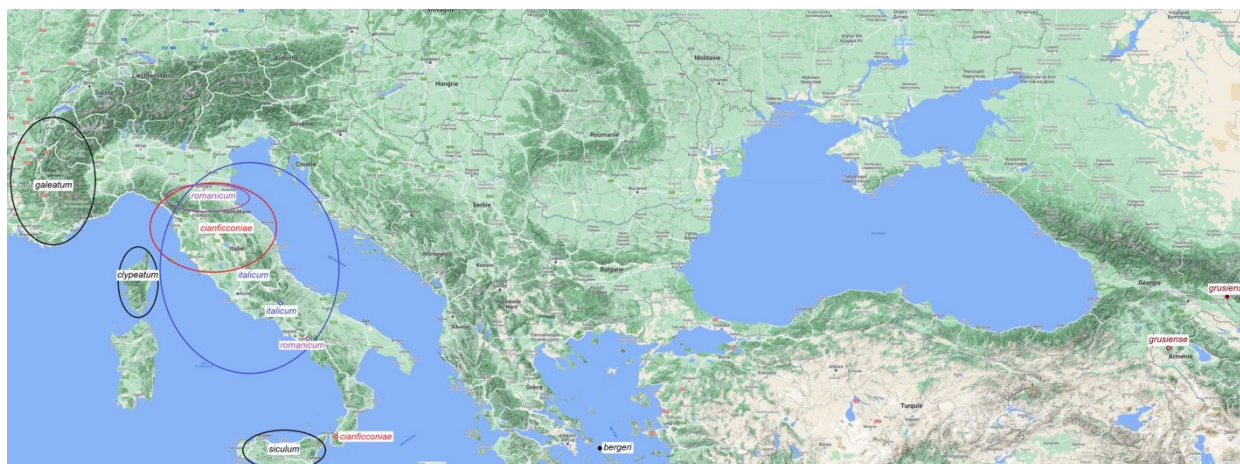
Sericostoma romanicum Navas, 1930: Malicky 2002: 11. „I, Rio Meri, 26.VI.2001 1♂, 1♀.” “Die mittleren Anhänge sind ungeteilt, schlank, spitz und distal leicht nach oben gekrümmt.”

Material examined. **Italy**, Campania, N Curticelle, N Giffoni Valle Piana, spring and brooklet, 720 – 820 m, 40.781°N, 14.924°E, 21.V.2021 leg. G. Vinçon (1 male, OPC).

***Sericostoma siculum* McLachlan, 1876**

(Figure 139) (Map 8)

Sericostoma siculum McLachlan, 1876:232. “Sicily (Bellier de la Chavignerie), one ♂ in the De Selys collection.” “In the ♂ the penis-sheaths are simple, the lower branch being entirely absent; the lower edge somewhat dilated before the slender apical portion, which is very slightly curved.”



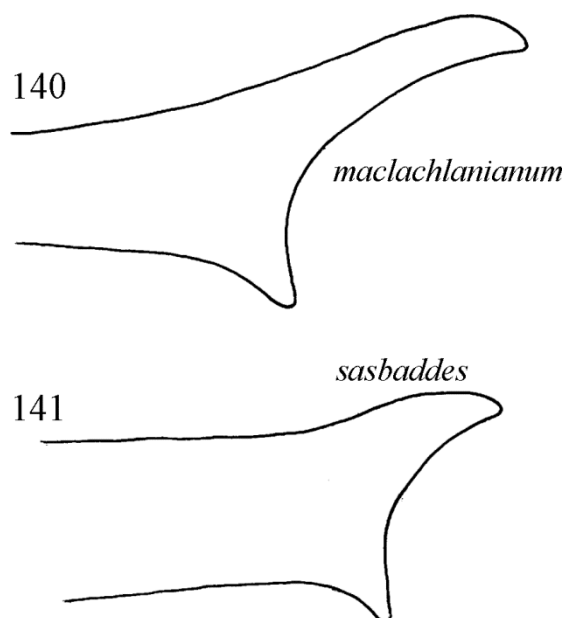
Map 8. Distribution of the *Sericostoma galeatum* group in Greece, Sardinia, and Spain (full circles represent the type localities).

Sericostoma maclachlanianum species complex

(Figures 140–141) (Map 9)

This small species complex represented by two species in Sardinia: *Sericostoma maclachlanianum* and *S. sasbaddes*. This is a species complex with maxillary palp slightly prominent. Paraproct is characterized by very widely opened abbreviated fork with broad short branches; dorsal branch longer; ventral branch is very short. The dorsal branch is longer at *S. maclachlanianum* than at *S. sasbaddes*. According to the widely opened terminal structure of the paraproct the *Sericostoma maclachlanianum* complex is close and has relation to the *Sericostoma vittatum* complex.

According to Malicky (2010) at some specimens the delineation of the two species with the length of the dorsal branch of the paraproct is not consistent. This is not surprising, it is rather a rule, a typical condition characterizing the development of incipient sibling species. However, it is remarkable how the divergence of the two lineages is realised in isolation by integrative organisation in a small Island. The divergence of such a genetically and spatially close lineages is detectable only by such a detailed sampling as realised in the detection of splitting and in the delineation of siblings as well as describing the new species, *S. sasbaddes* Malicky, 2010.



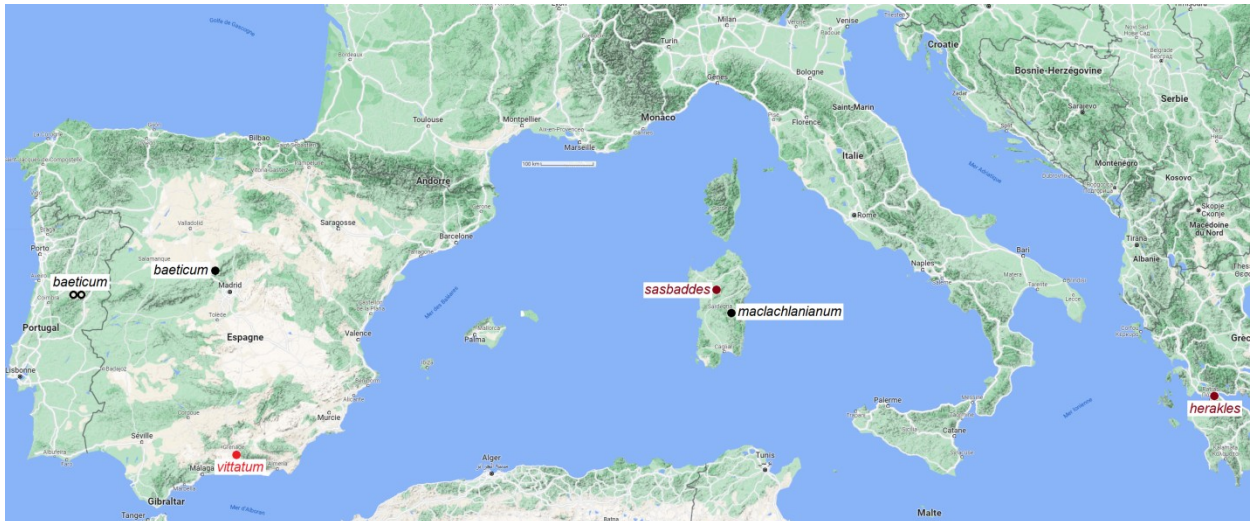
Figures 140–141. Lateral profile of the paraproct in the *Sericostoma maclachlanianum* species complex
140 = *S. maclachlanianum*; 141 = *S. sasbaddes*.

Sericostoma maclachlanianum Costa, 1884

(Figure 140) (Map 9)

Sericostoma maclachlanianum Costa, 1884:21. Sardinia!

Sericostoma maclachlanianum Costa, 1884: McLachlan 1884:22. “Island of Sardinia (Aritzo and the Mt. Gennargentu, A. Costa, 2 ♂ in the Naples Museum;



Map 9. Distribution of the *Sericostoma maclachlanium* and *vittatum* groups in the Alps and Italian Peninsula (full circles represent the type localities).

also one in my own collection, presented to me by Prof. Costa.” Maxillary palpi of the ♂ slightly prominent.” “In the ♂ the upper branch of the penis-sheaths is long, nearly straight, or slightly curved downward at the tip (in one example the appendage seems slightly crenulated at the tip); lower branch shorter, directed downward almost at a right angle, triangular at the base, the apical portion slightly curved.” “Very distinct in the form of the penis-sheaths from anything known to me. In some respects intermediate between *clypeatum* (of Corsica) and *baeticum* (of Spain and Portugal), and, on the whole, probably more allied to the latter.”

Sericostoma maclachlanianum Costa, 1884: Malicky 2010:34. Typen stammen von Aritzo und vom Genargentu-Gebirge (McLachlan, 1884:22). „Wie die Karte zeigt, bewohnt *S. maclachlanianum* das Genargentu Gebirge.”

***Sericostoma sasbaddes* Malicky, 2010**

(Figure 141) (Map 9)

Sericostoma sasbaddes Malicky, 2010:31–33. „Holotypus ♂: Sardinien, Sas Baddes, 8°51'E, 40°25'N, 430m, 2.VI.1981, leg Malicky, in meiner Sammlung. Close to *S. maclachlanianum* Costa, 1884. „Charakteristisch sind die mittleren Anhänge, die eine nach hinten und eine nach unten gerichtete Spitze haben, wobei die erste kürzer ist als bei *maclachlanianum*.”

***Sericostoma personatum* species group**

(Figures 142–150) (Map 10)

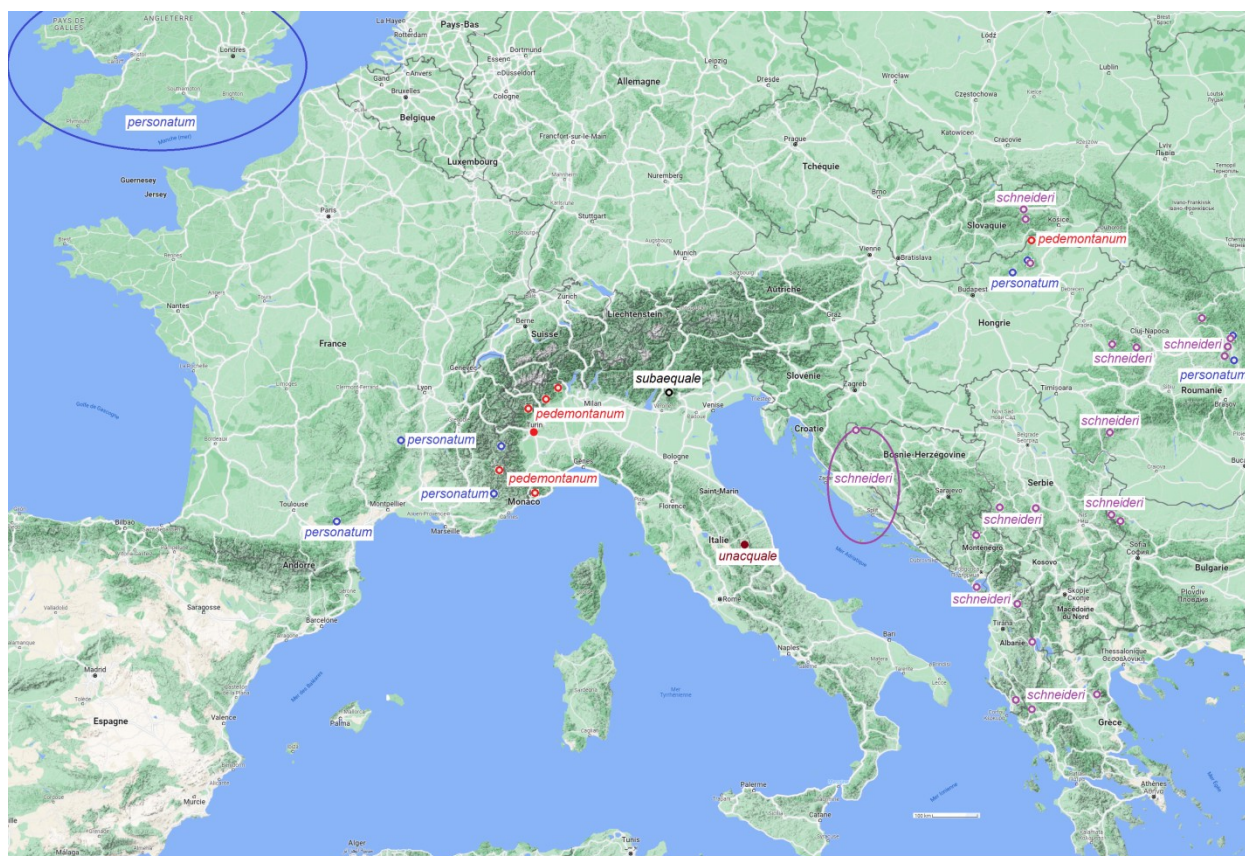
This species group has apical region of paraproct clearly simple furcate. The dorsal branch of paraproct is simple (typically) spine-like, usually a tapering pointed process as the dominant trait. Possibly the recessive (sleeping) traits of dorsal prong, tooth or corrugation on the dorsal branch could be present, infrequently observable as signs of standing genetic variation, incomplete lineage sorting or indication of reinforcement processes in contact zones or clines.

Five species belong to this group: *Sericostoma pedemontanum* McLachlan, 1876; *Sericostoma personatum* (Spence, 1826); *Sericostoma schneideri* (Kolenati, 1848); *Sericostoma subaequale* McLachlan, 1898; *Sericostoma unaequale* sp. nov.

***Sericostoma pedemontanum* McLachlan, 1876**

(Figures 142, 147) (Map 10)

Sericostoma pedemontanum McLachlan, 1876:229. “Turin (Italy) (Ghiliani). I possess one ♂. Possibly only an extreme local form of *personatum*. Upper branch of the fork of the penis-sheaths much longer



Map 10. Distribution of the *Sericostoma personatum* group in Europe (full circles represent the type localities).

than the lower, slender, slightly curved, the two branches rather widely divergent.”

Sericostoma pedemontanum McLachlan, 1876: McLachlan 1884:20–21. “My former *personatum* was in part made up of materials that I now consider to belong to *pedemontanum*. Regarding all the materials (200–300 examples) before me as pertaining to one species, this is one of the most common insects in all the more hilly district from Northern Central Europe to Central Italy, but I have not seen it (with certainty) from the Pyrenees and the Iberian Peninsula.”

Material examined. **France**, Provence Alps, Jausiers, 44.390 6.776, 1500 m, 11.VII.2007, leg. M. Bálint (7 males, 5 females, OPC). France, Alpes-Maritimes, Caïros Valley, Fromagine spring, 1500m, 44.0208°N, 7.4317°E, 17.VII.2022, leg. Gilles Vinçon (5 males, 5 females; OPC). **Hungary**, Aggtelek national Park, Ménes

stream, 23.VII.1985, light leg. J. Oláh (1 male, OPC). **Italy**, Piemonte, Pennines Alps, Biella, above Santuario di Oropa, spring, 45.6435°N, 7.969°E, 1800m, 4.VII.2020, leg. Gilles Vinçon (1 male, OPC). Italy, Graian Alps, Ingria, torrent, Rio del Mulinet, 45.463°N, 7.5676°E, 900 m, 8.VIII.2020, leg. Gilles Vinçon (1 male, OPC). Italy, Castel Vittorio (IM) 400m, affl. Rio Gordale T.L., 30.V.2001, leg. Museo Caffi BG, Coll Mus. Sc. Nat. Bergamo (1 male, OPC). Italy, Piemont, Pennines Alps, Civiasco, spring below water catchment, 770 m, 45.8104°N, 8.2973°E, 27.V.2022, leg. Gilles Vinçon (2 males, OPC).

Remarks. Due to the various intermediate forms of paraprot between *Sericostoma personatum* described from England and *Sericostoma pedemontanum* described from Italy (Piemonte) their delineation became uncertain and doubtful, sometimes synonymised in faunal list (Coppa &

Tachet 2022). However, as explained above the presence of intermediate forms are rather a rule than exception for incipient sibling species in contact or along cline populations under reinforcement with standing genetic variation and incomplete lineage sorting. In Italy (Piemont) and in France (Provence Alps) near locus typicus we have examined pure population with typical paraproct, identical with the type's speciation trait. The divergence in the lateral profile of the paraproct is supported by the divergence in the curvature of the sclerotized phallic organ. The curvature is more developed in *S. pedemontanum* than in *S. personatum*.

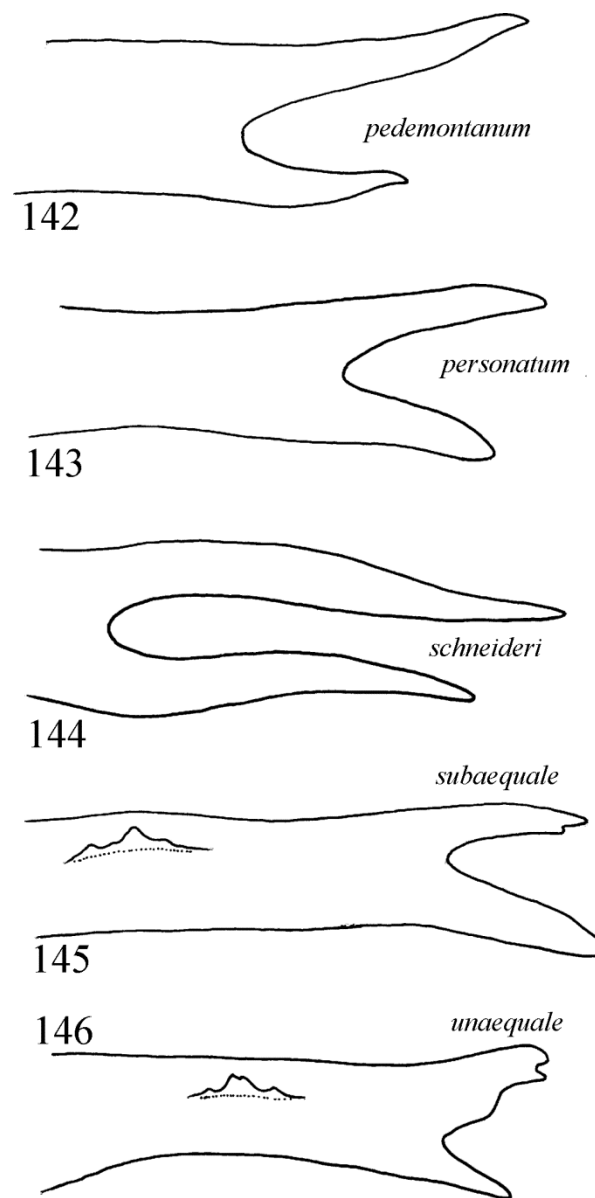
***Sericostoma personatum* (Spence, 1826)**

(Figures 143, 148) (Map 10)

Phryganea personata Spence. In Kirby & Spence 1826:489. „But the animal distinguished by the most remarkable cheeks is a species of *Phryganea* L. (*Phryganea personata* Spence); for from this part projects a spoon-shaped process, which curves upwards, and uniting with that of the other cheek, forms an ample mask before the face, the anterior and upper margin of which, in the insect's natural state, are closely united; and the posterior part being applied to the anterior part of the eye, causes the face to appear much swollen. It looks as if it was a single piece; but upon pressing the thorax it opens, both above and in front, into two parts, each convex without and hollow within, and each having attached to its inside a yellow tuft of hair resembling a feather. The use of this machinery at present remains a mystery.” This species was described from Britain (England) without any collecting data!

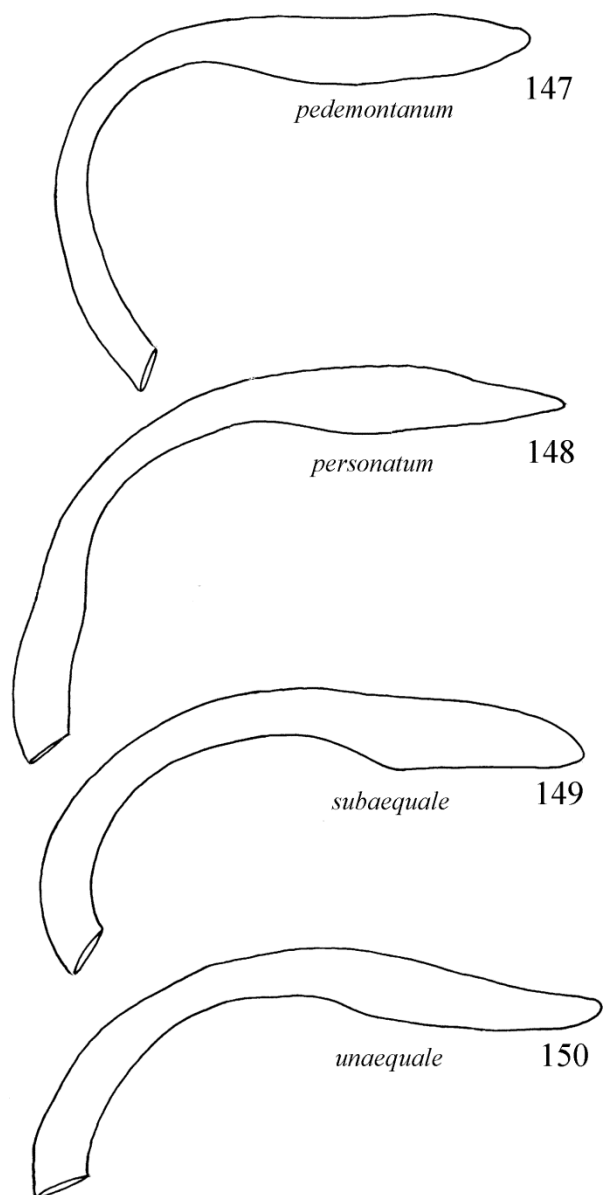
Phryganea personata Spence. Kirby & Spence 1826: McLachlan 1876:226–229. „Sheaths (Typically) with the upper branch of the fork straight, broad at its base, and somewhat suddenly acuminate, lower branch curved downward, thinner, and slightly longer.”

Phryganea personata Spence. Kirby & Spence 1826: McLachlan 1879:46. „I have again examined the large mass of materials representing *personatum* in my collection, with regard to the possibility of two distinct species being comprised under the name. Taking the extremes in the condition of the furcated penis-sheaths, two species should exist, but I find intermediate gradations.”



Figures 142–146. Lateral profile of the paraproct in the *Sericostoma personatum* species group. 142 = *S. pedemontanum*; 143 = *S. personatum*; 144 = *S. schneideri*; 145 = *S. subaequale*; 146 = *S. unaequale* sp. nov.

Phryganea personata Spence. Kirby & Spence 1826: McLachlan 1880:19. „It is extraordinarily variable in the form of penis-sheaths, and I cannot decide that this is to any considerable extent dependent upon locality. As a rule, the upper branch is shorter than the lower, thicker, the upper apical edge oblique to the apex, and turned slightly downward, sometimes with distinct notch before the oblique apical edge.”



Figures 147–150. Lateral profile of the phallic organ in the *Sericostoma personatum* species group. 147 = *Sericostoma pedemontanum*; 148 = *S. personatum*; 149 = *S. subaequale*; 150 = *S. unaequale* sp. nov.

Material examined. **France**, Lespinassière, 43.402°N 2.532°E, 450 m, 14.VII.2007, leg. M. Bálint (1 male, OPC). France, Mt. Mezenc, Borée, Massif Central, 44.908 4.228, 1026m, 15.VII.2007, leg. M. Bálint (1 male, OPC). France, Hautes-Alpes, Queyras Massif, Aiguilles, torrent below ‘Grand Laus lake’, 2560 m, 44.82°N, 6.87°E, 15.VIII.2021, leg. G. Vinçon (1 male,

OPC). France, Alpes-de-Haute-Provence, Ravin de St Barnabé, Verdon trib., road to Stade de neige de Vauplane, spring, 1400 m, 43.867°N, 6.632°E, 19.IX.2021, leg. G. Vinçon (1 male, OPC). France, Alpes-de-Haute-Provence, < Cayolle Pass, spring ‘Fontaine Gaudine’, 1690 m, 44.3216°N, 6.7039°E, 18.VII.2022, leg. G. Vinçon (1 male, OPC). France, Haute-Savoie, Bauges Massif, above Chevaline, spring, 1560 m, 45.7245°N, 6.1993°E, 26.VI.2022, leg. G. Vinçon (1 male, OPC). **Hungary**, Bükk Mountains, Szalajka stream, collected by folia tent of J. Szabó, 11.VII.1982 (1 male, 2 females; OPC). Hungary, Recsk, Oroszlánvár, 18.VI.2012, leg. P. Gombkötő, T. Korompai, G. Magos & L. Urbán (1 male, OPC). **Italy**, Piémont, brook and spring tributary of Stura di Demonte, above Villaggio Primavera, 1530 m, 44.373°N, 6.9755°E, 16.VII.2022, leg. G. Vinçon (1 male, OPC). **Romania**, Valea Cupas, Lacu Rosu, 9.VII.1981, leg. Peregovits & Ronkay (1 male, OPC). Romania, Județul Harghita, Sinclaieni, Valea Mare, 13.VII.1993, light trap leg. L. Keresztes (1 male, OPC).

Remarks. The real difficulty in *Sericostoma* taxonomy was to differentiate between *Sericostoma personatum* (Spence, 1826) and *Sericostoma pedemontanum* McLachlan, 1876. The two species are frequently intermingled in various habitats of contact zones or clines and producing various intermediate shapes of paraproct lateral profiles. However, in pure population we have very typical form of paraproct as drawn for the type specimens already by McLachlan. Moreover, we have found the rigid, not flexible sclerotized curved tube of the phallic organ very specific in the examined four species in the *Sericostoma personatum* species group (Figs. 147–150).

Sericostoma schneideri and its synonyms

Sericostoma schneideri (Kolenati, 1848)

(Figures 144) (Map 10)

Prosoptionia schneiderii Kolenati, 1848:89. „Habitat in Dalmatia (Stenz!), apud Kellemsch (Loew!).”

Prosoptionia schneiderii Kolenati, 1848: Botosaneanu 2001:520. „I could study the type specimen of *S.*

- schneideri* (kept in the NHMW). Compared to the holotype of *S. flavicorne*, the holotype of *S. schneideri* has completely different lateral sclerites of the ♂ Xth segment.”
- Prosoptionia schneideri* Kolenati, 1848: Botosaneanu 2001:519. „Kolenati proposed *Prosoptionia schneideri* as replacement name for *Sericostoma flavicorne* Schneider, 1845, arguing that „jam *Phryganea flavicornis* sub Genere *Chaetotaulii* existit” (*Chaetotaulius* Kolenati, 1848 is a synonym of *Limnephilus* Leach, 1815). In his description Kolenati mentions not only Dalmatia, but also „Kellemisich” under „Habitat”. Kolenati’s errors were noticed by McLachlan (1876:230): „Kolenati united it (i.e.: *flavicorne*) to the next species (i.e.: *schneideri*) changing the name unnecessary”.
- Sericostoma carinthiacum* McLachlan, 1868:296. “Preth Valley, Upper Carinthia, 26th May (Zeller), 1♂.” “App. intermed. deeply furcate, the prongs nearly equal in length, each being very acute, and slightly curved at the tips in opposite directions.”
- Sericostoma pyrenaicum* Pictet, 1856:88–89. „J’ai trouvé cette espèce à Eaux-Bonnes (Spain, [in fact Eaux-Bonnes is in France]), dans les Pyrénées, au mois de juillet.”
- Sericostoma selysi* Pictet, 1856:91–92. „J’ai pris cette espèce dans la Sierra de Guadarrama (Spain), au mois de juillet.”
- Sericostoma* No. 5 sp. nov. Hagen, 1859:148. „Baiern, Oesterreich.” „Fühler einfarbig, gelb.” „Die untere Spitze der app. interm. länger als die obere.”
- Sericostoma timidum* Hagen, 1864:88. „Baiern, Oesterreich.” „Fühler einfarbig, gelb.” „Die untere Spitze der app. interm. länger als die obere.”
- Sericostoma timidum* Hagen, 1864: McLachlan 1876: 22–230. I have not seen Hagen’s types of *timidum*, and there is a discrepancy in his description, for he says the under point of the sheaths is longer than the upper; it may be that the words „untere” and „obere” are transposed, and with this idea I have sunk my *carinthiacum* as a synonym. My description and figures are from the type of *carinthiacum*.”
- Sericostoma turbatum* McLachlan, 1876:231: 231. “Belgium (Vieil Salm, Halloy, &c., De Selys), apparently common.” “According to the structure of the anal parts, *pyrenaicum*, *flavicorne* (?), *schneideri*, *selysi*, and *turbatum*, are scarcely distinguishable.”
- Examined material.** **Albania**, Delvina Region, between Bistrica Village and Syri i Kalter, 127 m, 39°55'53"N; 20°09'13"E 13.V.2017, leg. S. Beshkov & A. Nahirnic (4 males, 1 female; OPC).
- Albania**, Periferi Dibre, Fushe-Lure, streamside and lumber-yard, 1055m, 29.VI.2007, leg. L. Dányi, Z. Eröss, Z. Fehér, A. Hunyadi & D. Murányi (1 male, HNHM). **Albania**, Delvinë District, Krongj, stream Vrisi, 140m, 39.91720°N 20.18245°E, to light, 09.05.2014 leg. Z. Barina, D. Pifkó & G. Puskás (6 males, 3 females; OPC). **Albania**, Pogradec district, Piskupat, Ohrid Lake at Hotel Leon S of the village, 41°01.152'N, 20°38.196'E, 695 m, 12.05.2014, T. Kovács, D. Murányi (1 female, OPC). **Bosnia & Herzegovina**: Una-Sana Canton, Mrazovac, stream at open spring, 45°02'42"N, 16°05'19.7"E, 246 m, 26.V.2012, leg. T. Kovács & G. Puskás (3 males, OPC). **Bulgaria**, W Stara Planina Mts. Gushovski Monastir above Tchiprovtzi Town, 43.3661°N 22.8402°E, 808 m, 26.VI.2021, leg. S. Beshkov & A. Nahirnic-Beshkova (1 male, OPC). **Bulgaria**, W. Stara Planina Mts, Zarezan Tcheshma above Tchuprene on Tchuprenska Reka river, 674m, 43.4874°N, 22.6154°E, 24.VI.2021, leg. S. Beshkov & A. Nahirnic-Beshkova (40 males, 10 females; OPC). **Greece**, Ioannina county, Lefkothea, Smolitsas River 4km E of the village, 39°43'03.2"N, 20°36'38.7"E, 198m, 12.V.2006, leg. L. Dányi, J. Kontschán & D. Murányi (1 male, 8 females, HNHM). **Greece**, Olympos, 1100 m, 9.VII.1986, leg. Á. Uherkovich (1 male, OPC). **Hungary**, Bükk Mountains, Garadna stream, just below Sebesvíz tributary, 8.VII.1983, leg. J. Oláh (5 males, 2 females; OPC). **Montenegro**, Bar municipality, Rumija Mts, Stari Bar, M. Mikulići, Rikavac, 42°06'16.7"N, 19°08'55.8"E, 320 m, 26.V.2013, leg. P. Juhász, T. Kovács, G. Magos, G. Puskás, (1 male, 3 females; OPC). **Montenegro**, Durmitor Mts., Zabljak, 24–26, VII. 1965, leg. Z. Varga (1 male, 8 females; OPC). **Romania**, Valea Cupas, Lacu Rosu, 21.VII.1981, leg. Peregovits & Ronkay (1male, 1 female; OPC). **Romania**, Banat, Iauna, 29.VII.2006, leg. M. Bálint (1 male, OPC). **Romania**, Apuseni Mts. Muntii Gilaului, Muntele Baisorii, stream Valea Gera, 46°33.001'N 23°20.014'E, 1055m, 18.VI. 2013, light leg. J. Oláh, Cs. Balogh, & S. Fekete (7 males, OPC). **Romania**, Apuseni Mts., Bihor Mts., Crisul Pietros – Valea Bulz, Pietra Bulzului, 560m, 3.VII.2013, light leg. Cs. Balogh, (2 males, 6 females; OPC). **Romania**, Apuseni Mts., Bihor

Mts., Crisul Pietros, Boga, Valea Bulz and Valea Galbena, 46°35'23.25"N 22°37'54.74"E, 450m, 4.VII.2013, light leg. Cs. Balogh, (14 males, 1 female; OPC). Romania, Eastern Carpathians, Vasláb (Voslabeni), Harghita County, marshy area, 11.VII.2002, leg. L. Keresztes (2 males, 24 females; OPC). Romania, Eastern Carpathians, Calimani Mts., Toplita stream, 29.VII.2003, leg. L. Keresztes (2 male, OPC). Romania, Eastern Carpathians, Harghita County, Baile Chirui (Királyfürdő), 14.VII.1998, leg. Z. Izsák (11 male, 7 females; OPC). Romania, Eastern Carpathians, Harghita County, Sincraieni, Valea Mare, 24.VI.1993, light trap leg. L. Keresztes (17 male, 13 females; OPC). Romania, Eastern Carpathians, Harghita County, Sincraieni, forester's house, 31.VII.1992, leg. L. Keresztes, T. Ujvárosi & Z. Izsák (17 male, 6 females; OPC). Romania, Eastern Carpathians, Vasláb (Voslabeni), Harghita County, marshy area, 11.VII.2002, leg. L. Keresztes (3 males, 15 females; OPC). **Serbia**, Zlatibor district, Zlatibor Mts, spring brook of Crni Rzav Stream beneath Mt. Cigota, 43°37.932'N, 19°46.305'E, 1160 m, 25.V.2013, leg. P. Juhász, T. Kovács, G. Magos, G. Puskás, (1 male, OPC). Kraljevo, above Kamenica Village, Stolovi Mt. Veliki čukar, 43°36'07"N 20°41'08"E, 688 m, 4.VII.2021, leg. S. Beshkov & A. Nahirnic-Beshkova (1 male, 2 females; OPC). **Slovakia**, Hnilec stream, 27.VII.1964, leg. J. Oláh (14 male, 4females; OPC). Slovakia: Hrabusice (Káposztafalva), Podlesok camping, Velka Bela voda, 48°57'50"N 20°23'1"E, 546 m, 9. VII. 2012 light trap, leg. P. Boda, B. A. Lukács, I Szivák & G. Várbió (4 males, 1 female; OPC).

Diagnosis. Holotype paraproct: "practically parallel slender branches, lower one mostly slightly shorter, with acute apices, dorsal branch devoid of any dorsal prong or point" (Botosaneanu 2001). Paraproct structure is extremely stable in the examined populations from Albania, Bosnia & Herzegovina, Bulgaria, Greece, Hungary, Montenegro, Romania, Serbia, Slovakia. The basic structure of the paraproct is entirely different, unmistakable with the paraproct of *Sericostoma flavicorne*. Following synonymes belong to *Sericostoma schneideri* (Kolenati, 1848): *Serico-*

stoma carinthiacum McLachlan, 1868; *Sericostoma pyrenaicum* Pictet, 1856; *Sericostoma selysi* Pictet, 1856; *Sericostoma timidum* Hagen, 1864; *Sericostoma turbatum* McLachlan, 1876.

Sericostoma subaequale McLachlan, 1898

(Figures 145, 149) (Map 10)

Sericostoma subaequale McLachlan, 1898:49. „It seems to me that the examples from North Italy and South Tyrol... should be considered to have claim to specific rank and a name. The designation above given has reference to the sub-equal condition of the branches of the penis-sheaths, which is the most salient character.”

Material examined. **Italy**, Trentino Alto Adige, Venetian Pre-Alps, Raossi, Speccheri, brook below the dam, low current, 670 m, 45.7648°N, 11.1301°E, 27.V.2021, leg. G. Vinçon (4 males, OPC).

Sericostoma unaequale sp. nov.

(Figures 146, 150) (Map 10) (Photos 14, 15)

Material examined. Holotype: **Italy**, Marches, Parco Nazionale dei Monti Sibillini, above Casali, nice brook and spring, 1080 m, 42.9506°N, 13.177°E, 18.V.2022, leg. G. Vinçon (1 male, OPC). Paratype: same as holotype (1 female in copulation with the holotype, OPC).

Diagnosis. Having apical region of the paraproct furcate, this new species belongs to the *Sericostoma personatum* species group and the paraproct lateral region bearing a dark dental ridge a character present in *Sericostoma subaequale*. However *Sericostoma unaequale* differs from *S. subaequale* by having completely unaequal apical branches.

Description. The uniform and monotonous external morphological characters are the same as or similar to all of the others species of this small genus. Male facial mask, the sexually modified maxillary palp of the male is small. Medium-sized species with forewing length of 13 mm. Wing and parts of the body are covered by pubescent

bronzish-brown coloured setae. The spiniform pair of paraprocts closely associated with segment X has unequally bilobed apical ending. Dorsal arm is more robust characterized by bifid apex; ventral arm is slender spine-like.

Etymology. Named by the characteristic, unequally shaped apical lobes or arms of the paraproct.

***Sericostoma vittatum* species complex**

(Figures 151–153) (Map 9)

This small species complex consists of three species. Two species distributed in the Iberian Peninsula: *Sericostoma baeticum*, *S. vittatum* and one species in Greece: *S. herakles*. Species complex with small maxillary palp. Paraproct is characterized by very widely opened fork branches; dorsal branch longer with or without subapical dorsal prong; ventral branch is short.

A species complex of well-known variability in Spain with incipient sibling species under reinforcement. This is represented in the rather pronounced variation of the lateral profile of the speciation trait that is the paraproct. However, the variation is within the limits of the basic structural characters. There is distinct variation in the form of paraproct of the *S. baeticum*, influenced largely by locality, but it is impossible to regard all the examples other than as pertaining to a single species as stated clearly already by McLachlan (1880). *S. vittatum*, one of the most distinct-looking species due to the golden-yellow vitta on the anterior wings of the males. However, there are intermedier paraproct shapes between the two species in the Iberian Peninsula (Schmid, 1952).

***Sericostoma baeticum* Pictet, 1856**

(Figure 151) (Map 9)

Sericostoma baeticum Pictet, 1856:88. „J’ai trouvé cette espèce à San Ildefonso (Spain), au mois de juillet.”

Sericostoma baeticum Pictet, 1856: McLachlan 1876: 234. „Spain, (San Ildefonso, July, E. Pictet).” „Maxillary palpi of the ♂ small.” „Superior branch

of the penis-sheaths is long, flattened, its apex cut very obliquely, the extreme point acute; the lower branch forms an elongately triangular acute tooth.”

Material examined. **Portugal**, Serra da Estrela Massif, above Loriga, nice brooklets, 940 m, 40.3381°N, 7.7074°W, 23.IV.2022, leg. G. Vinçon (2 males, 1 female; OPC). **Portugal**, Serra da Estrela Massif, North Valezim, nice spring, 650 m, 40.3718°N, 7.713°W, 23.IV.2022, leg. G. Vinçon (1 male, 1 female; OPC).

***Sericostoma herakles* Malicky, 1999**

(Figure 152) (Map 9)

Sericostoma herakles Malicky, 1999:47. “HT ♂: Griechenland, Peloponnes, Ano Kastritsi bei Patras, 23.V.1979, leg. m.” “Diese Art unterscheidet sich von allen anderen bekannten durch die sehr langen, in einem Winkel von etwa 60° gespreizten Gabeläste der mittleren Anhängen des ♂, wobei der dorsale leicht nach unten gekrümmt, der ventral fast gerade und deutlich kürzer ist.”

***Sericostoma vittatum* Rambur, 1842**

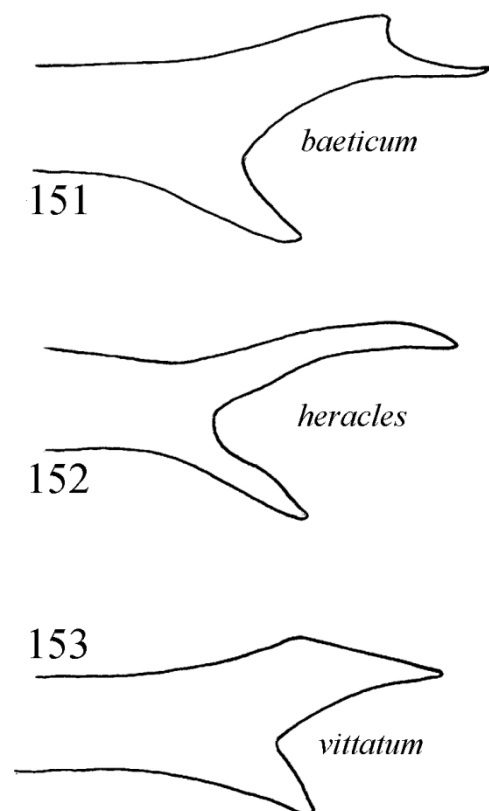
(Figure 153) (Map 9)

Sericostoma vittatum Rambur, 1842:497. “J’ai pris deux individus mâles de cette espèce dans des pentes marécageuses et herbeuses de la Sierra-Nevada, aux environs de Grenade.”

Sericostoma vittatum Rambur, 1842: McLachlan 1876:234. “Spain, Granada and San Ildefonso, Rambur, and Pictet).” “Maxillary palpi of the ♂ only slightly prominent. “Anterior-wings with median longitudinal golden-yellow vitta. The only species in the genus in which the anterior wings have distinct markings. “The penis-sheaths formed after the same style as in *S. baeticum*, but the upper branch is very much shorter, and is broader.”

Poorly known species

Still there are poorly known, puzzling species. They are without available type specimens and without published proper drawings or with insufficient examination of the paraproct. Judging from the available information, mostly from their locus typicus, they are probably synonyms of one of the above surveyed species.



Figures 151–153. Lateral profile of the paraproot in the *Sericostoma vittatum* species complex. 151 = *Sericostoma baeticum*; 152 = *S. heracles*; 153 = *S. vittatum*.

***Sericostoma cristatum* Navas, 1924**

Sericostoma cristatum Navas, 1924:27–28. “L’aspecte exterior és de semblance amb el *S. selysi* E. Pict.” “Patria. (Spain) Olot (Girona), 10 de Julio de 1923.”

***Sericostoma faciale* McLachlan, 1868**

Sericostoma faciale McLachlan, 1868:296–197. “Switzerland, on the Aar (Eaton). The form of app. in-terme. is also very different from any other species with which I am acquainted.”

***Sericostoma festivum* Rambur, 1842**

Sericostoma festivum Rambur, 1842:497. “J’ai reçu cette belle espèce de M. le professeur Graells, qui l’a découverte dans les environs de Madrid.”

***Sericostoma hamiferum* McLachlan, 1876**

Sericostoma hamiferum McLachlan, 1876:232. “Dartmoor (England). I believe this locality to be erroneous, and that they are more probably from some part of North Italy, in which Leach resided before his death.” “A very distinct species. According to homology it is the inner (or upper) branch of the penis-sheaths that is totally absent, whereas the outer (or lower) forms the hook.”

***Sericostoma indivisum* McLachlan, 1880**

Sericostoma indivisum McLachlan, 1880:48. “Pomerania (in Hagen’s collection); also Elberfeld and Hamburg according to Hagen, but I have not examined these.” “A puzzling form with the palpi of the ♂ very prominent as in *personatum* and most of the species that follow it, but with the penis-sheaths consisting of little more than a slender curved upper branch as in the Corsican *clypeatum*.” “I give no figure of the penis-sheaths, as it cannot be made satisfactorily without removing one on the inferior appendages.”

***Sericostoma medium* Navas, 1917**

Sericostoma medium Navas, 1917:12–13. “Simile vittato Ramb.” “Patria. (Spain) Tortosa (Tarragona), 22 de Julio de 1914; Albarracin (Teruel), 12 de Julio de 1904; Tramacastilla (Teruel), 12 de Julio de 1904 (Col. m.)”

***Sericostoma memorabile* McLachlan, 1876**

Sericostoma memorabile McLachlan, 1876:229. “Alps of Dauphiné, France. I captured one ♂ at a roadside spring on the summit of the Col du Lautaret, a mountain pass of about 5500 feet elevation; July 12th.”

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Appendix 1. Habitat photos of the collection localities



Photo 1. France, Ariège, path to Arlu Lake, 1650m, 42.8142°N, 1.438°E (G. Vinçon)
(*Wormaldia arlua* sp. nov. and *Anisogamus sandreniko* sp. nov.).



Photo 2. France, Ariège, path to Arlu Lake, nice spring, 1650m, 42.8142°N, 1.438°E (G. Vinçon)
(*Wormaldia arlua* sp. nov. and *Anisogamus sandreniko* sp. nov.).



Photo 3. Portugal, Serra da Estrela, 1450m, 40.3802°N, 7.6457°W (G. Vinçon) (*Plectrocnemia estrela* sp. nov.).



Photo 4. Spain, Asturias, Puerto del Palo Allande, 950m, 43.2778°N, 6.6681°W (G. Vinçon) (*Plectrocnemia estrela* sp. nov.).



Photo 5. Spain, Cantabria, above Yera, 600 m, 43.1377N, 3.7461W (G. Vinçon) (*Rhyacophila fusunae* sp. nov.).



Photo 6. France, Pyrénées-Orientales, Sorède, La Farga, 450 m, 42.4979°N, 2.9572°E (G. Vinçon)
(*Ptilocolepus kover* sp. nov.).



Photo 7. France, Alpes-Maritimes, Cairos tributary of Roya Valley, 1020 m, 44.011°N, 7.46°E (G. Vinçon)
(*Drusus roya* sp. nov.).



Photo 8. France, Alpes-Maritimes, Caïros tributary of Roya Valley, 1020 m, 44.011°N, 7.46°E (G. Vinçon) (*Drusus roya* sp. nov.).



Photo 9. Italy, Piémont, above Villaggio Primavera 1530 m, 44.373°N, 6.9755°E (G. Vinçon) (*Drusus demonta* sp. nov.).



Photo 10. France, Pyrénées-Orientales, Prats-de-Mollo-la-Preste, 1860 m, 42.4523°N, 2.4102°E (G. Vinçon) (*Anisogamus nahueli* sp. nov.).



Photo 11. France, above Mantet, 1850 m, 42.4755°N, 2.325°E (G. Vinçon) (*Anisogamus nahueli* sp. nov. and *A. waringeri* Graf & Vitecek, 2015).



Photo 12. Austria, Kärnten, S. Bad Vellach, Vrnik-Quelle, 1380 m, 46.4214°N, 14.5723°E (G. Vinçon)
(*Consorophylax vellach* sp. nov.).



Photo 13. Austria, Kärnten Alpen (G. Vinçon) (*Consorophylax vellach* sp. nov.).



Photo 14. Italy, Marches, Monti Sibillini, above Casali, 1080 m, 42.9506°N, 13.177°E (G. Vinçon) (*Sericostoma unaequale* sp. nov.).



Photo 15. Italy, Marches, Monti Sibillini, Panico Valley (G. Vinçon) (*Sericostoma unaequale* sp. nov.).