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Article

Heleniella reginae sp. n., a new species occurring in the Mutt glacial stream, Swiss Alps (Diptera, Chironomidae, Orthocladiinae)

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ABSTRACT

Male adult of *Heleniella reginae* sp. n. is described based on material collected by Malaise traps placed along the glacial stream of Mutt (Swiss Alps, upper Rhône basin). Distinctive specific characters include in particular: anal tergal bands absent; virga composed of two long rods, thick basally fused apically; sternapodeme lacking lateral horn-like projection; anal point short and wide, with apex composed of six small lobes; inferior volsella broadly semicircular and distinctly enlarged. The new species resembles to *H. assiana* Moubayed, 2026. They appear both to be considered as two sister species.

Keywords: taxonomy, new species, Swiss Alps, conservation measures.

Heleniella reginae sp. n., une nouvelle espèce connue du haut bassin du Mutt, torrent glaciaire des Alpes Suisses (Diptera, Chironomidae, Orthocladiinae)

RÉSUMÉ

L'adulte mâle d'*Heleniella reginae* sp. n. est décrit à partir d'un matériel collecté avec des tentes Malaise placées le long du Mutt, torrent glaciaire du haut bassin du Rhône (Alpes Suisses). Les caractères distinctifs incluent en particulier : bandes tergales anales absentes ; virga composée de deux longues branches épaisses à leur base et avec apex très fin ; sternapodème dépourvu d'une corne latérale ; - pointe anale, courte et large, à l'apex muni de six petits lobes ; volselle inférieure semi-circulaire et élargie. La nouvelle espèce ressemble à *H. assiana* Moubayed, 2026. Elles seraient considérées toutes deux comme espèces sœurs.

Mots-clés : taxonomie, nouvelle espèce, Alpes Suisses, mesures de conservation.

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1. Introduction

The Mutt stream (length: 3600m) originating from the Mutt glacier (area 0.6 km^2, altitude 2582-3000 m) represents the major tributary of the upper Rhône catchment. It joins the Rhône River at the upper limit of a floodplain and contributes approximately 10 % (0.62 m^3/s in 1997) to the Rhône discharge (KNISPEL & CASTELLA 2003). The upper parts of the Mutt catchment are composed mainly of moraines and bare rocks including a carbonate outcrop. Alpine grasslands are found in the lower parts while *Salix* spp. and *Alnus viridis* thickets, together with herbaceous alpine vegetation, are predominant in the floodplain (LODS-CROZET et al. 2001).

Based on some published knowledge on the taxonomy, geographical distribution and ecology of the genus *Heleniella* Gowin, 1943 (BRUNDIN 1956, REISS 1968, RINGE 1976, CRANSTON et al. 1989, ANDERSEN & WANG 1997, LANGTON & PINDER 2007, ASHE & O'CONNOR 2012, SÆTHER & SPIES 2013, MOUBAYED-BREIL & LODS-CROZET 2016, MOUBAYED-BREIL & GAULTIER 2018, MOUBAYED 2026a, 2026b), currently there are eight reported *Heleniella* species from Europe: *H. crenophila* Moubayed, 2026; *H. dorieri* Serra-Tosio, 1966; *H. extrema* Albu, 1972; *H. gaultieri* Moubayed-Breil, 2018; *H. helenae* Moubayed, 2026; *H. helvetica* Moubayed-Breil & Lods-Crozet, 2016; *H. ornaticollis* (Edwards, 1929) and *H. serratosioi* Ringe, 1976. In this paper, the male adult of *H. reginae* sp. n. is diagnosed and described based on male adult collected by Malaise traps placed along lotic habitats delimited by the glacial alpine stream of Mutt (Swiss Alps).

2. Material and methods

Male adult of *H. reginae* sp. n. is collected using Malaise traps placed along the Mutt glacial stream (Photos 2-3) originating from the Mutt glacier of the upper Rhône catchment (alt. 2582-3000m). The type-material was preserved in 80-85% ethanol for the taxonomic examination and description. Information on the methodology of mounting and conservation of the type-material is provided in MOUBAYED & LANGTON (2019). Morphological terminology and measurements follow those of SÆTHER (1980) and LANGTON & PINDER (2007) for the imagines.

3. Description

Heleniella reginae sp. n.

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Material examined

Holotype. **Switzerland**: One male adult, Canton of Valais, catchment of the upper Rhône, Mutt glacial stream (Station M4, Photos 2-3), altitude 2100 m. 14-22.IX.1997, 46°34'04.946"N, 8°24'17.159"E, leg. B. Lods-Crozet. Environmental data of Mutt stream water are: crystalline water, conductivity: 61–183 µS/cm; temperature: 1–8 °C during late spring to late summer (June-September). In the streamlet and rheocrenes located close to station M4, conductivity ranged between 103 to 253 µS/cm; temperature 4.4. to 14.8 °C (ILG et al. 2001).

Holotype (mounted on one slide; GBIF-CH00617918) is deposited in the collections of the 'Naturéum, Muséum cantonal des sciences naturelles, département de Zoologie, Palais de Rumine, Place de la Riponne 6, CH-1014 Lausanne, Suisse'.

Etymology. The new species is named *reginae* in honour of our colleague and friend Régine Bernard, who recently passed away. Over the last few years, she had been working as a hydrobiologist at the environmental consultant Biolconseil S.A. and was very active in conservation of the biological and ecological quality of water and environment in the canton of Valais.

Diagnostic characters

H. assiana Moubayed, 2026 is the nearest *Heleniella* species to *H. reginae* sp. n., as figured in MOUBAYED (2026a, Fig. 1, Photo 1).

	fe	ti	ta_1	ta_2	ta_3	ta_4	ta_5	LR
PI	1045	1070	810	430	380	235	170	0.75
PII	1015	1120	535	325	255	190	150	0.48
PIII	1070	1060	515	320	280	170	150	0.49

Table I. Heleniella reginae *sp. n. Leg ratio of the male adult: LR = length of tarsomere ta_1 divided by length of tibia* (*ti*).

However, the new described species can be easily separated from other related congeners, in particular from *H. assiana* by a combination of the following distinctive characters: postnotum with 12 setae; anal tergal bands absent; virga consists of two rods, thick basally, projecting downwards, fused distally; anal point unusually shaped bearing 6 small lobes apically; transverse sternapodeme slender, lacking lateral horn-like projection; inferior volsella large lobe-like, broadly semi-circular; crista dorsalis limited to the proximal part of gonostylus.

Male imago

(n = 1, HT; PT in alcohol; Fig. 1A-D; Photo 1)

Medium to big sized *Heleniella* species. Total length 2.65 mm, abdomen and anal segment nearly 1 mm long. Wing length 1.45 mm. General colouration contrasting dark brown to brownish. Head and thorax dark brown to brown; legs brownish, anal segment contrasting dark brown to brown.

Head. Eyes densely hairy, inner eye margin bare; temporals consist of 21 setae including 16 inner (in 2 rows) and 5 outer verticals. Clypeus trapezoidal. Palp 5-segmented, segments 3 and 4 subequal in length; sensilla clavata and chaetica present on palpomere 3. Antenna is missing. Thorax. All thoracic setae are decumbent except for the dorcentrals, which are arising from a distinct pale spot. Scutellum densely covered with setae; postnotum (Fig. 1A) with 12 setae including: 9 on anterior part in 2 rows and 3 on lateral side. Wing. Brachiolum with one seta; squama unusually bare. Legs. Femur, tibia, tarsus (Table 1) and claws are long and more robust, are shorter and less robust in *H. assiana*.

Abdomen. Hypopygium in dorsal view as in Fig. 1 and Photo 1; Fig. 1 illustrated without sternapodeme, coxapodeme and phallapodeme. Tergite IX about 80 μm long, semicircular at base and median part, becoming progressively tapering caudally; posterior margin with about 16 short setae placed in 2-3 rows (8 on each side). Virga (Fig. 1B, D; Photo 1A) about 150 μm long, consists of 2 long rods projecting downwards reaching posterior part of tergite IX; composed of 2 thick not fused long rods at base, ending with 1 single winding and fine filament. Transverse sternapodeme (Photo 1B) weakly developed, thick laterally, thin orally, lateral horn-like absent. Phallapodeme (Fig. 1E, Photo 1C) about 70 μm long, thin crotchet-like medio-basally, aedeagal lobe absent, basal expansion crotchet–like shaped. Anal point (Fig. 1BC; Photo 1D) very small to vestigial about 3 μm long, unusually shaped, composed of 6 short typical lobes. Gonocoxite about 175 μm, 65 μm maximum width, inner basal margin sinuated, inner apical dorsal margin bearing a characteristic conspicuous specific lobe as illustrated in Fig. 1B and Photo 1F**.** Inferior volsella (Fig. 1B, Photo 1E) about 70 μm as long as wide, large lobe-like projecting transversally, rounded apically, apex and median area densely covered with short and medium sized setae. Gonostylus (Fig. 1, Photo 1G) about 75 μm long (*assiana-ornaticollis* type), massive, posterior margin bearing several stout setae including 2 longer inserted close to the megaseta; crista dorsalis present on proximal part, large lobe-like covering about 70 % of the anterior side; megaseta well developed, inserted apically. HR, 2.3; HV, 3.5.

Pupal exuviae and larva: unknown.

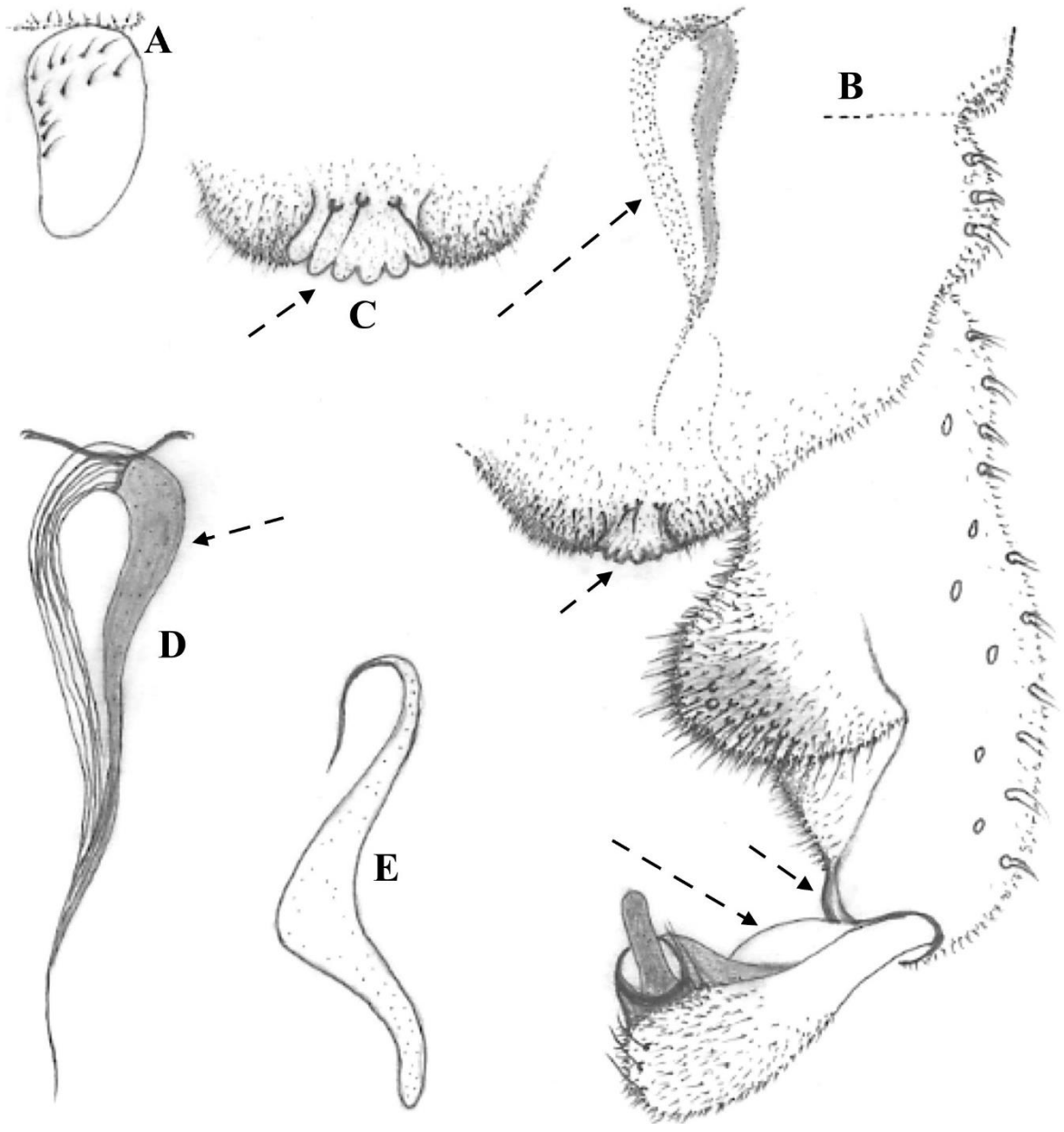

Figure 1. Male adult of H. reginae *sp. n. Postnotum,* (*A*)*; hypopygium in dorsal view* (*B*)*; anal point, dorsal* (*C*)*; virga* (*D*)*; phallapodeme* (*E*)*. Arrows indicate some distinctive characters.*

*Figure 1. Adulte mâle d'*H. reginae *sp. n. Postnotum* (*A*) *; hypopyge, vue dorsale* (*B*) *; pointe anale* (*C*) *; virga* (*D*) *; phallapodème* (*E*)*. Les flèches indiquent quelques caractères distinctifs.*

4. Remarks and differential diagnosis

H. reginae sp. n. belongs to the subgroup of *Heleniella* species including *H. assiana*, *H. ornaticollis* and *H. serratosioi*.

H. assiana represents the nearest species to the new species, which can both be considered as sister species based on some morphological resemblances, in particular the shape of their virga and inferior volsella. In the following, a combination of atypical distinctive characters found in the male adult of *H. reginae* sp. n. are compared to

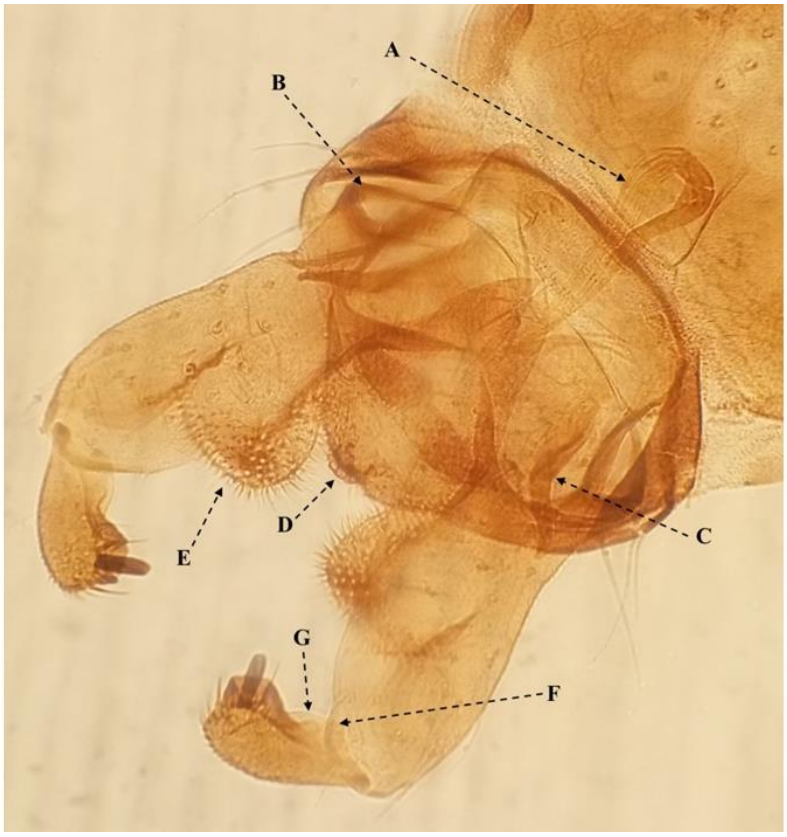

Photo 1. Heleniella reginae *sp. n. Hypopygium in dorsal view. Virga, basal part* (*A*)*; lateral horn of sternapodeme* (*B*)*; phallapodeme* (*C*)*; anal point* (*D*)*; inferior volsella* (*E*)*; inner apical lobe of gonocoxite* (*F*)*; gonostylus and crista dorsalis* (*G*).

Photo 1. Heleniella reginae *sp. n. Hypopyge en vue dorsale. Virga, partie basale* (*A*) *; corne latérale du sternapodème* (*B*) *; phallapodème* (*C*) *; pointe anale* (*D*) *; volselle inférieure* (*E*) *; lobe apical interne du gonocoxite* (*F*) *; gonostyle et crista dorsalis* (*G*).

those of *H. assiana* as documented by MOUBAYED (2026a, Fig.1 and Photo 1);

- Legs (femur, tibia and tarsus of PI, PII and PIII) are much longer and more robust in *H. reginae* sp. n. as reported in Table I;

- Virga (Fig. 1B-C, Photo 1A) not forked and fused distally, nearly reaching posterior area of tergite IX; is markedly forked distally in *H. assiana* (MOUBAYED 2026a, Fig. 1 BC; Photo 1A);

- Transverse sternapodeme lacking horn-like lateral expansion (Photo 1B), is bearing a conspicious lateral horn in *H. assiana* (MOUBAYED 2026a, Photo 1B);

- Anal point unusually composed of 6 specific apical small lobes (Fig. 1BC, Photo 1D), is drop-like shaped in *H. assiana* (MOUBAYED 2026a, Fig. 1B; Photo 1D);

- Inferior volsella large lobe-like shaped, not projecting downwards (Fig.1B, Photo 1E); is less larger and distinctly more projecting downwards in *H. assiana* (MOUBAYED 2026a, Fig. 1B; Photo 1E);

- Gonocoxite with rounded apical part, bearing a specific inner basal lobe-like expansion (Fig. 1B, Photo 1F); is otherwise shaped in *H. assiana* (MOUBAYED 2026a, Fig. 1 B; Photo 1F);

- Gonostylus with a well developed crista dorsalis (Fig. 1B, Photo 1G), is bearing a low crista dorsalis in *H. assiana* (MOUBAYED 2026a, Fig. 1 BC; Photo 1 A);



Photo 2. The Mutt stream valley with the Mutt glacier in the back (*photo B. Lods-Crozet*).

Photo 2. Vallée du Torrent du Mutt avec le glacier du Mutt en arrière-plan (*cliché B. Lods-Crozet*).

To date, there are three reported species by SÆTHER & SPIES (2013) from Switzerland: *H. helvetica*, *H. ornaticollis* and *H. serratosioi*. Consequently, the description of *H. reginae* sp. n. increases the total number to four from this country.

5. Ecology and geographical distribution

H. reginae sp. n. is typically rheophilic, stenothermic and crenophilous strictly confined in lotic habitats. Enriched micro-habitats with bryophytes, diatoms represent the favourable microhabitats for larval populations. Emergence period: early to late summer. Therefore, the new species appears to belong to the large community of crenobiontic and crenophilous species as documented by LINDEGAARD (1995). Occurrence of *H. reginae* sp. n. in such pristine habitats indicates that it is more widespread in other similar zones of glacial streams located in neighbouring countries, namely Austria, Italy, etc.

To date, the geographical distribution of *H. reginae* sp. n. is currently restricted to the Alpine glacial catchments of the upper Rhône, Mutt stream (Photos 1-2). The presence of new species in some high mountain Alpine ranges of Switzerland highlights the importance of cold glacial enclaves, considered to be hotspots of endemism and biodiversity of Alpine river basin (MOUBAYED-BREIL & LODS-CROZET 2016, 2018, MOUBAYED & LODS-CROZET 2022, 2023, LODS-CROZET & MOUBAYED 2024). Such species are considered to be biogeographically representative and their loss would be biologically indicative of global warming and local climate change. However, the new species appears to belong to a local biogeographic representative, which deserves greater consideration and conservation measures.

Associated alpine and boreoalpine species encountered in the same locality as *H. reginae* sp. n. include (LODS-CROZET 2012, MOUBAYED-BREIL & LODS-CROZET 2016, 2018, MOUBAYED-BREIL & LODS-CROZET 2022, 2023, LODS-CROZET & MOUBAYED 2024): *Krenopelopia binotata* (Wiedemann, 1817); *Boreoheptagyia alpicola* Serra-Tosio, 1989; *B. legeri* (Goetghebuer, 1933); *D. bertrami* Edwards, 1935; *D. goetghebueri* Pagast, 1947; *D. laticauda* Serra-Tosio, 1954 ; *D. latitarsis* (Goetghebuer, 1921); *D. lindrothi* Goetghebuer, 1941 ; *D. cinerella* Meigen, 1835; *D. zernyi* Edwards, 1933; *Pseudodiamesa branickii* (Nowicki, 1873); *Pseudokiefferiella parva* Edwards, 1932 ; *Brillia bifida* (Kieffer, 1909) ; *Bryophaenocladius flexidens* Brundin, 1947; *B. helveticus* Moubayed & Lods-Crozet, 2022; *B. subvernalis* (Edwards, 1929); *Chaetocladius laminatus* Brundin, 1947 ; *C. castellae* Moubayed-Breil & Lods-Crozet, 2018; *C. lencioniae* Moubayed-Breil & Lods-Crozet, 2018; *C. lodscrozetae* Moubayed-Breil 2018 ; *C. muttensis* Moubayed-Breil & Lods-Crozet, 2018; *C. longivirgatus* Stur & Spies, 2011; *C. suecicus* (Kieffer, 1916); *Eukiefferiella brevicalcar* Kieffer, 1911; *E. fittkaui* Lehmann, 1972; *E. fuldensis*



Photo 3. Type locality of Heleniella reginae *sp. n. on the Mutt stream (2100m); (photo by B. Lods-Crozet).*
*Photo 3. Localité-type d'*H. reginae *sp. n. Torrent glaciaire Mutt, Alpes Suisses (2100 m) ; (cliché B. Lods-Crozet).*

Lehmann, 1972; *E. lobifera* Goetghebuer, 1934 ; *Heleniella helvetica* Moubayed-Breil & Lods-Crozet, 2016; *Krenosmittia camptophleps* (Edwards, 1929); *Limnophyes bidumus* Saether, 1990 ; *L. natalensis* (Kieffer, 1914) ; *Metriocnemus eurynotus* (Holmgren, 1883) ; *M. fuscipes* (Meigen, 1818); *Orthocladius luteipes* Goetghebuer. 1938; *O. frigidus* (Zetterstedt, 1838) ; *Parametriocnemus stylatus* (Spaerck, 1923) ; *Paraphaenocladius exagitans monticola* Strenzke, 1950 ; *Paratrichocladius skirwithensis* (Edwards, 1929) ; *Parorthocladius nudipennis* (Kieffer, 1908) ; *Pseudorthocladius curtistylus* (Goetghebuer, 1921) ; *Smittia alpicola* Goetghebuer, 1941 ; *S. alpilonga* Rossaro & Lencioni, 2000 ; *S. edwardsi* Goetghebuer, 1932 ; *S. rostrata* Goetghebuer, 1962 ; *Tokunagaia rectangularis* (Goetghebuer, 1933); *Tvetenia calvescens* (Edwards, 1929) ; *Micropsectra notescens* (Walker, 1856) ; *M. radialis* Goetghebuer, 1939.

References

ANDERSEN, T. & X. WANG. 1997. Darkwinged *Heleniella* Gowin, 1943 from Thailand and China (Insecta, Diptera, Chironomidae, Orthocladiinae). *Spixiana*, **20** (2): 151-160.

ASHE, P. & J.P. O'CONNOR. 2012. *A World Catalogue of Chironomidae (Diptera). Part 2. Orthocladiinae*. Irish Biogeographical Society & National Museum of Ireland, Dublin. 968 pp.

BRUNDIN, L. 1956. Zur Systematic der Orthocladiinae (Diptera, Chironomidae). *Report of the Institute of Freshwater Research*, Drottningholm, **37**: 5-185.

CRANSTON, P.S., D.R. OLIVER & O.A. SÆTHER. 1989. The adult males of Orthocladiinae (Diptera, Chironomidae) of the Holarctic region - Keys and diagnoses. In Wiederholm, T. (ed.): Chironomidae of the Holarctic region. Keys and diagnoses. Part 3 - Adult males. *Entomologica Scandinavica, Supplement* **34**: 164-352.

ILG, C., E. CASTELLA, B. LODS-CROZET & P. MARMONIER. 2001. Invertebrate drift and physico-chemical variables in the tributaries of the Mutt, a Swiss glacial stream. *Archiv für Hydrobiologie*, **151**: 335-352. https://doi.org/10.1127/archiv-hydrobiol/151/2001/335

KNISPEL, S. & E. CASTELLA. 2003. Disruption of a longitudinal pattern in environmental factors and benthic fauna by a glacial tributary. *Freshwater Biology*, **48**: 604-618. https://doi.org/10.1046/j.1365-2427.2003.01030.x

LANGTON, P.H & L.C.V. PINDER. 2007. Keys to the adult males of Chironomidae of Britain and Ireland. Volume 1 (Pp 1-239) and volume 2 (Pp 1-68). *Freshwater Biological Association, Scientific Publication*, n° 64.

LINDEGAARD, C. 1995. Chironomidae (Diptera) of European cold springs and factors influencing their distribution. *Journal of the Kansas Entomological Society, Supplement* **68** (2): 108-131.

LODS-CROZET, B. 2012. Les insectes méconnus des torrents alpins - Diversité des Chironomidés (Insecta, Diptera) dans le système glaciaire du Haut-Rhône valaisan. *Bulletin de la Murithienne*, **129** : 43-61.

LODS-CROZET, B., E. CASTELLA, D. CAMBIN, C. ILG, S. KNISPEL & H. MAYOR-SIMEANT. 2001. Macroinvertebrate community structure in relation to environmental variables in a Swiss glacial stream. *Freshwater Biology,* **46** : 1641-1661.

LODS-CROZET, B. & J. MOUBAYED. 2024. *Chaetocladius rottensis* sp. n., a glacial alpine species from the upper basin of the Rhône River, Switzerland (Diptera, Chironomidae, Orthocladiinae). *Ephemera*, **25**:13-23. https://doi.org/10.71868/J29Z-1A67

MOUBAYED, J. 2026a. Description of *Heleniella assiana* sp. n. from the upper basin of the River Assi in Lebanon (Diptera, Chironomidae). *Ephemera*, **27** : 81-88 https://doi.org/10.71868/a6ah-wk38

MOUBAYED, J. 2026b. *Heleniella crenophila* and *H. helenae* spp. n., two new species occurring in France. *Ephemera*, **27** : 93-105. https://doi.org/10.71868/6b4z-mv16

MOUBAYED, J. & LANGTON, P.H. 2019. *Chaetocladius berythensis* sp. n., *C. callauensis* sp. n., *C. guardiolei* sp. n. and *C. parerai* sp. n., four relict species inhabiting glacial springs and streams in eastern Pyrenees and Lebanon (Diptera, Chironomidae). *Chironomus Journal of Chironomidae Research,* **32**: 42-59. https://doi.org/10.5324/cjcr.v0i32.3000

MOUBAYED-BREIL, J. & P. GAULTIER. 2018. On the genus *Heleniella* Gowin, 1943 (*extrema*-gr). I. *H. gaultieri* sp. n. a crenophilous species confined to glacial streams in Eastern Pyrenees (Diptera, Chironomidae, Orthocladiinae). *Ephemera,* **19** (2): 71-81.

MOUBAYED-BREIL, J. & B. LODS-CROZET. 2016. *Heleniella helvetica* sp. n., a cold stenothermic species inhabiting the upper Rhône catchment in central Switzerland (Diptera, Chironomidae, Orthocladiinae). *Journal of Entomological and Acarological Research,* **48** (6026): 339-344. https://doi.org/10.4081/jear.2016.6026

MOUBAYED-BREIL, J. & B. LODS-CROZET. 2018. On the genus *Chaetocladius* s. str. Kieffer, 1911 from Switzerland with descriptions of five new relic species occurring in glacial alpine springs and streams (Diptera, Chironomidae). *Alpine Entomology,* **2** : 15-34. https://doi.org/10.3897/alpento.2.22759

MOUBAYED-BREIL, J. & B. LODS-CROZET. 2022. On the genus *Bryophaenocladius* Thienemann, 1934. I. Taxonomic notes with description of new species (Diptera, Chironomidae, Orthocladiinae). *Eurasian Entomological Journal*, **21** (4): 212-224. https://doi.org/10.15298/euroasentj.21.4.05

MOUBAYED-BREIL, J. & B. LODS-CROZET. 2023. *Limnophyes knispelae* sp. n. and *L. sartorii* sp. n., two new crenophilous species from the Swiss Alps (Chironomidae, Orthocladiinae). *Chironomus Journal of Chironomidae Research*, **37** : 48-58. https://doi.org/10.5324/cjcr.v0i37.5012

REISS, F. 1968. Neue Chironomiden-Arten (Diptera) aus Nepal. *Khumbu Himal*, **3** (1): 55-73.

RINGE, F. 1976. *Heleniella serratosioi* n. sp., eine neue Orthocladiine (Dipt., Chir.) aus der Emergenz von Rohrwiessenbach und Kalbach. *Archiv für Hydrobiologie*, **77** (2): 254-266.

SÆTHER, O.A. 1980. Glossary of chironomid morpho-

logy terminology (Diptera, Chironomidae). *Entomologica Scandinavica*, *Supplement* **14**: 1-51.

SÆTHER, O.A. & M. SPIES. 2013. Fauna Europaea: Chironomidae. In P. Beuk & T. Pape (eds): Fauna Europaea: Diptera Nematocera. Fauna Europaea version 2.6. Internet database at http://www.faunaeur.org (accessed February 2015).