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Article

Redescription of *Corynoneura magna* Brundin, 1949 from acidic springs and peat bogs in north-eastern France (Diptera, Chironomidae, Orthocladiinae)

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ABSTRACT

Material of two abundant populations composed of male adults, pupae and larvae of *Corynoneura magna* Brundin, 1949 was recently collected in lentic to semi-lentic habitats including acidic springs and peat bogs located in north-eastern France (alt. 350 and 900 m). In this paper, *C. magna* is recorded for the first time from continental France. A detailed redescription of the male adult is given. The following distinguishing characters will separate it from other members of the genus *Corynoneura*: antenna 12-segmented, apical seta present or absent; third palpomere spherical, fifth palpomere notched apically, with 1 apical seta; tibial scale of PIII smooth; sternapodeme inverted U-shaped; phallapodeme scalpel shaped, joint with sternapodeme with a sharp triangular attachment; tergite IX bilobed, with 1 pair of apical setae; gonocoxite truncate apically, ventral junction with branched setae; inferior volsella lobe shaped, located distally; gonostylus massive, megaseta ellipsoidal, or slender with pointed apex. Worldwide, there are currently about 105 known *Corynoneura* species, of which 45 are reported from the Palaearctic Region and 13 from France. Taxonomic remarks and comments on the ecology and geographical distribution of *C. magna* are given.

Keywords: *Corynoneura magna*, redescription, male adult, acidic springs and peat bogs, north-eastern France, conservation measures.

Redescription de *Corynoneura magna* Brundin, 1949 de sources et tourbières acides du nord-est de la France (Diptera, Chironomidae, Orthocladiinae)

RESUMÉ

Un matériel composé d'adultes mâles, de nymphes et de larves de *Corynoneura magna* Brundin, 1949 a été récemment collecté dans deux abondantes populations de sources et tourbières acides du Nord-Est de la France. Une redescription détaillée de l'adulte mâle est présentée. Les caractères distinctifs suivants permettent de séparer cette espèce des autres membres du genre *Corynoneura* : antenne avec 12 segments, présence ou absence d'une soie apicale; troisième palpomère sphérique, cinquième avec une encoche et une soie apicale ; pointe tibiale de PIII émoussée ; sternapodème en forme d'U-inversé ; phallapodème en

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forme de scalpel, attaché au sternapodème au moyen d'une protubérance triangulaire pointue; tergite IX bilobé; gonocoxite avec apex tronqué, jonction ventrale munie de soies ramifiées, volselle inférieure en forme de lobe, située en position distale ; gonostylus massif, mégasoie massive ou effilée. Actuellement, près de 105 espèces de *Corynoneura* sont connues à l'échelle mondiale, dont 45 de la Région paléarctique et 13 de France. Un commentaire sur la position systématique, l'écologie et la distribution géographique de *C. magna* est fourni.

Mots-clés : *Corynoneura magna*, adulte mâle, nouvelle description, sources et tourbières acides, mesures de conservation.



Photo 1. *Corynoneura magna*: locality in Ardennes region. Photo G. Coppa.

Photo 1. *Corynoneura magna* : localité dans le département des Ardennes. Cliché G. Coppa.



Photo 2. *Corynoneura magna*: locality in Vosges region. Cliché A. Gérard.

Photo 2. *Corynoneura magna* : localité dans le département des Vosges. Cliché A. Gérard.

1. Introduction

Based on data and worldwide records on the taxonomy and geographical distribution of the genus *Corynoneura* Winnertz, 1846. According to data on the taxonomy and geographical distribution of the genus *Corynoneura* Winnertz, 1846 (WINNERTZ 1846, BRUNDIN 1949, SCHLEE 1968a, 1968b, SASA 1979, TUISKUNEN 1983, HIRVENOJA & HIRVENOJA 1988, CRANSTON et al. 1989, SÆTHER & KRISTOFFERSEN 1996, HAZRA et al. 2003, MAKARCHENKO & MAKARCHENKO 2006, 2010, LANGTON & PINDER 2007, FU et al. 2009, WIEDENBRUG & TRIVINHO-STRIXINO 2011, ASHE & O'CONNOR 2012, FU & SÆTHER 2012, WIEDENBRUG et al. 2012, SÆTHER & SPIES 2013, FANG et al. 2014, MOUBAYED-BREIL 2015), there are currently about 105 valid species reported from all zoogeographical Regions including: 45 (Palearctic), 21 (Nearctic), 25, (Neotropic), 25 (Oriental), 4 (Afrotropical), 5 (Australasian).

In this paper, the male adult of *C. magna* is re-described since its description from Sweden by BRUNDIN (1949). The examined material is composed of abundant populations of adults, pupae and larvae recently collected in some acidic springs and peat bogs located in the Ardennes and Vosges regions (north-eastern France).

2. Material and methods

Two abundant populations of adults, pupae and larvae were collected in semi-lentic acidic habitats in two north-eastern regions of continental France. The adults were captured using sweep nets, the pupae and larvae by Surber and drift nets. The 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). Terminology, nomenclature and measurements of the imagines, follow those of SÆTHER (1980) and LANGTON & PINDER (2007). Taxonomic remarks and comments on the ecology and geographical distribution are provided.

3. New description

Corynoneura magna Brundin, 1949

Material examined

Continental France : Bazeilles (08053, Ardennes region), « La Fange aux Loups » (Photo 1), acidic peat bogs, 49°44'38" N - 5°03'48" E, alt 356 m, 24.01.2021, 5 male adults (each mounted on 1 slide); Francheval (08179, Ardennes), « La Fange des Bouleaux », 49°44'09" N - 5°05'57" E, alt. 370 m, 23.04.2022, 2 male adults (preserved in 70% alcohol) (leg G. Coppa). Vosges region, Machais Nature Reserve; 48° 00' 24" N, 06° 57' 34" E; alt. 900 m; acidic springs and peat bogs (Photo 2); environmental data of water: crystalline water, conductivity (Cd) 8-28 μ S/cm; T°C, 1-4 during late winter, 8-12 during late summer; pH acid, 5-6; 15 male adults including 5 mounted on 3 slides and 10 preserved in alcohol (leg A. Gérard).

One male adult (mounted on one slide) is deposited in the collections of the 'Musée cantonal de Zoologie, Palais de Rumine, 6 place de la Riponne, CH-1014 Lausanne (MZL), Switzerland'. Remaining material is deposited in the collection of the authors.

The material was preserved in 80% alcohol, and later mounted in polyvinyl lactophenol. For each adult, the head, thorax and abdomen were cleared in 90% lactic acid then washed in 70% ethanol before mounting on slides.

Diagnostic characters

Male adult of *C. magna* can be separated from all the European species on the basis of the following combination of characters: antenna 12-segmented; last flagellomere much longer than the 3 preceding segments, not notched apically, with or without apical seta; third palpomere spherical, fifth notched apically, with 1 apical seta; calvus of wing with 9 setae; tibial scale of hind leg not projecting, smoothly truncate; sternapodeme orally projecting, inverted U-shaped;

	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₅	LR	BV	SV	BR
PI	315	405	225	130	55	35	40	0,56	3,63	3,20	2.50
PII	365	350	185	95	50	25	40	0,53	4,29	3,86	2.0
PIII	325	345	205	110	45	25	35	0,59	4,07	3,27	3.0

Table 1. “LR = length of tarsomere ta₁ divided by length of tibia (ti); BV = combined length of femur (fe), tibia and ta₁ divided by combined length of tarsomeres ta₂-ta₅; SV = ratio of femur plus tibia to tarsomere ta₁; BR = ratio of longest seta of ta₁ divided by minimum width of ta₁, measured one third from apex.”

transverse part straight, distinctly wide; phallopodeme scalpel-shaped, not projecting apically, joint to sternapodeme placed pre-lateral with a triangular median attachment; tergite IX bilobed, with one pair of apical setae (occasionally 4 pairs); ventral junction of gonocoxite densely covered with branched setae; inferior volsella large lobe shaped, located distally; gonostylus massive, megaseta long, ellipsoidal or slender with pointed apex.

Male imago

(n = 5 male adults; figures 1-9; 10A-D)

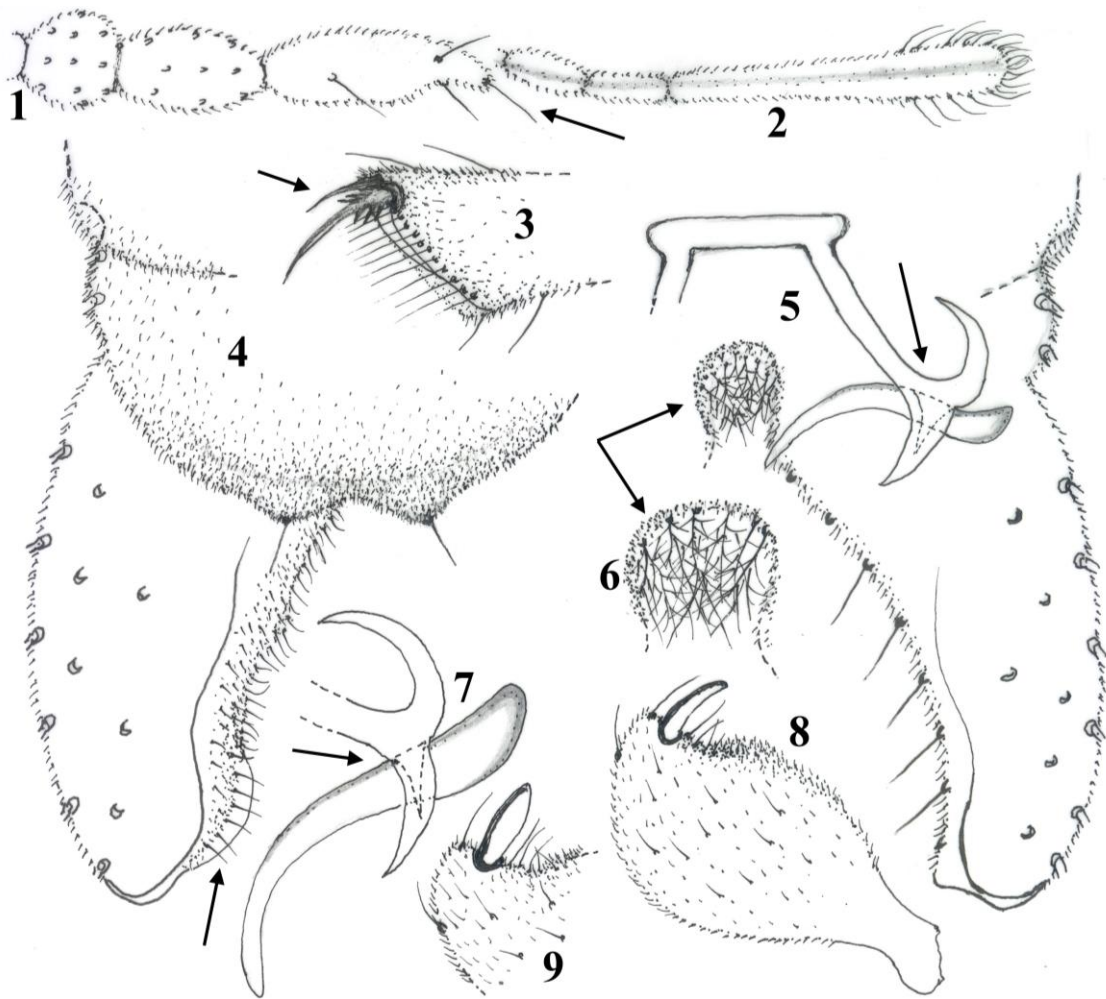
Total length 1.85 mm. Wing length 1.40 mm. General coloration contrasting brownish to dark brown especially in the thorax and abdomen. Head. Eyes bare; hairs present on proximal half of inner eye margin; temporals absent. Clypeus with 22 setae in 4 rows. Palp 5-segmented, segments 1 and 2 fused; segments 3-5 (Fig. 1), third palpomere spherical; fifth palpomere giving a similar appearance with that of *C. scutellata* Winnetz, 1846 as in HIRVENOJA & HIRVENOJA (1988), notched apically, with 1 apical seta; length (μm) of segments: 20, 25, 30, 40, 65. Antenna 715 μm long, 12-segmented; segments 5-11 subequal (40 μm each); last flagellomere (Fig. 2) not clubbed, much longer than the 3 preceding segments, covered with numerous apical sensilla chaetica, occasionally with 1 apical seta; antennal groove reaching segment 2; AR 0.91. Thorax. Lobes of antepnotum gaping; lateral antepnotals 3; dorsocentrals 7 including decumbent setae; prealars 7 uniserial; scutellum with 6 setae. Wing. Similarly shaped as figured in SÆTHER &

KRISTOFFERSEN (1996, Fig. 5) for *C. lacustris* Edwards, 1924. Maximum width 0.42 μm ; Width/length 0.30; brachiolum with one seta, calvus 310 μm long, with 9 setae. Legs. Apex of hind tibia (Fig. 3) distinctly truncate and not projecting, lacking S-shaped seta. Length (μm) and proportions of legs as in the Table 1.

Hypopygium in dorsal and ventral view as in Figs 4-5 and 10A-D. Posterior edge of tergite IX bilobed, with a pair of setae on each lobe; anal point absent. Laterosternite IX with 4 setae (2 on each side). Apodemes (Figs 5, 7, 10C-D). Sternapodeme well projecting orally, inverted U-shaped, transverse apodeme straight, distinctly wide, lateral expansion small, rounded; phallopodeme scalpel-like, not projecting apically, joint to sternapodeme placed pre-lateral with a sharp triangular attachment located medially. Tergite IX (Fig. 4) bilobed, with one pair of apical setae (occasionally 4 pairs). Gonocoxite 70 μm long, apex truncate clearly visible in ventral view as in Fig. 5; basal junction (Figs 5-6, 10C-D) densely covered with a characteristic ventral tuft of branched setae. Superior volsella absent. Inferior volsella (Fig. 4, 10A-B) well-developed, distinctly lobe shaped, inwardly protruding, located distally; inner margin bare and smooth, with a circular row of short setae. Gonostylus (Figs 8-9, 10A-B) 40 μm long, 20-25 μm maximum width, massive; megaseta about 7 μm long, ellipsoidal, occasionally slender with pointed apex. HR 1.75; HV 4.63.

Female adult: unknown.

Pupae, pupal exuviae and larva: known but not described.



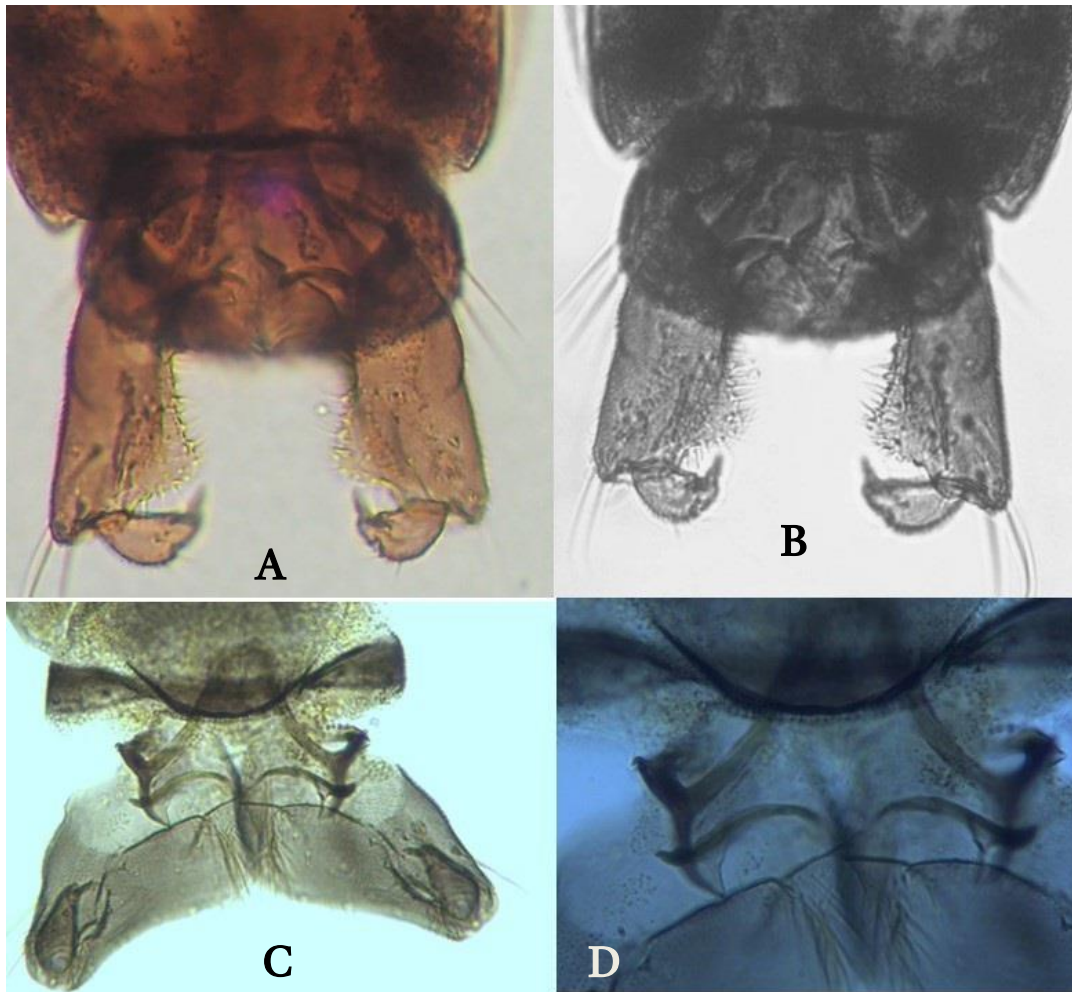
Figures 1-9. Male imago of *Corynoneura magna*. Palpomeres 3-5 (1); antenna, segments 11-12 (2); apex of hind tibia (3); hypopygium, dorsal (4) and ventral (5); junction of gonocoxites, ventral view (6); connection of sternapodeme with phallapodeme (7); gonostylus, Ardennes (8); gonostylus, Vosges, distal part (9). The arrows indicate some distinguishing characters.

Figures 1-9. Imago mâle de *Corynoneura magna*. Palpomères 3-5 (1); antenne, segments 11-12 (2); apex du tibia postérieur (3); hypopyge, vues dorsale (4) et ventrale (5); jonction du gonocoxite, vue ventrale (6); connexion entre phallapodeme et sternapodeme (7); gonostyle, Ardennes (8); gonostyle, Vosges, partie distale (9). Les flèches indiquent quelques caractères distinctifs

3. Taxonomic position

C. magna is reported here for the first time from continental France. Consequently, its citation increases the total number of known *Corynoneura* species from 12 to 13 from this country. Examined male adults from the Ardennes region show much more morphological resemblance with the

description of BRUNDIN (1949, Fig. 202) than those from the Vosges region. The only difference between the two examined populations is related to the shape of the megaseta, which is not ellipsoidal in specimens from the Vosges area. However, the main distinguishing characters found in the examined male adult of *C. magna* include:



Figures 10A-D. Male imago of *C. magna*. Hypopygium, dorsal (A-B), ventral (C-D).

Figures 10A-D. Imago mâle de *C. magna*. Hypopyge, en vue dorsale (A-B) et ventrale (C-D).

- third palpomere spherical; fifth notched apically, bearing 1 apical seta (Fig. 1); last flagellomere of antenna with 1 apical seta (Fig. 2);
- hind tibial apex not projecting (Fig. 3);
- phallapodeme scalpel-like, joint to sternapodeme with a sharp triangular attachment (Figs 5, 7, 10C-D); - ventral junction of gonocoxite with abundant branched setae (Figs 5-6, 10C-D);
- megaseta ellipsoidal or narrowed with pointed apex (Figs 8-9, 10A-B).

5. Ecology and geographical distribution

The genus *Corynoneura* includes both rheophilic, semi-lentic and lentic species mainly occurring in streams, rivers and the littoral zone of lakes and peat bogs. Habitats, where material of *C. magna* was collected, consist of cold acidic springs and peat bogs enriched with emerged and submerged aquatic plants and mud substrata (alt. 350 and 900 m, Photos 1-2). Such pristine habitats are actually endangered by pollution and various perturbation caused by human activities, deserve much greater consideration, protection and preservation. Larval populations of *C. magna* appear to belong to the crenobiontic community of species as documented by LINDEGAARD (1995). Chironomid species encountered in the same

habitats as *C. magna* include: *Arctopelopia barbittarsis* Zetterstedt, 1850; *Guttipelopia guttipennis* Van der Wulp, 1861; *Macropelopia nebulosa* (Meigen, 1804); *M. notata* (Meigen, 1818); *Procladius choreus* (Meigen, 1804); *P. lugens* (Kieffer, 1915); *P. sagittalis* (Kieffer, 1909); *Prodiamesa olivacea* (Meigen, 1818); *Bryophaenocladus dentatus* (Karl, 1937); *B. nidorum* (Edwards 1929); *Corynoneura carriana* Edwards, 1924; *C. lacustris* Edwards, 1924; *Cricotopus algarum* (Kieffer, 1911); *C. sylvestris* (Fabricius, 1794); *Gymnometriocnemus brumalis* (Edwards, 1929); *G. kamimegavirgatus* Sasa & Hirabayashi, 1993; *Dicrotendipes notatus* (Meigen, 1818); *D. pulsus* Walker, 1856; *Paratendipes albimanus* (Meigen, 1818); *Polypedilum nubeculosum* (Meigen, 1804); *Sergentia prima* Proviz & Proviz, 1997; *Micropsectra apposita* (Walker, 1856); *M. junci* (Meigen, 1818); *M. notescens* (Walker, 1856); *Tanytarsus brundini* Lindeberg, 1963; *T. mancospinosus* Ekrem, Reiss & Langton, 1999; *T. smolandicus* Brundin, 1947.

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References

- ASHE, P. & J.P. O'CONNOR. 2012. *A World Catalogue of Chironomidae (Diptera). Part 2. Orthoclaadiinae*. Irish Biogeographical Society & National Museum of Ireland, Dublin. 968 pp.
- BRUNDIN, L. 1949. *Chironomiden und andere Bodontiere der südschwedischen Urgebirgsseen. Ein Beitrag zur Kenntnis der bodenfaunistischen Charakterzüge schwedischer oligotropher Seen*. Reports from the Institute of Freshwater Research, Drottningholm, **30**: 1-914.
- CRANSTON, P.S., D.R. OLIVER & O.A. SÆTHER. 1989. The adult males of Orthoclaadiinae (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.
- FANG, X.L., X. WANG & Y. FU. 2014. A new Species of *Corynoneura* Winnertz from Oriental China (Diptera, Chironomidae, Orthoclaadiinae). *Zootaxa*, **3884** (6): 567-572.
- FU, Y. & O.A. SÆTHER. 2012. *Corynoneura* Winnertz and *Thienemanniella* Kieffer from the Nearctic Region (Diptera, Chironomidae, Orthoclaadiinae). *Zootaxa*, **3536**: 1-61.
- FU, Y., O.A. SÆTHER & X. WANG. 2009. *Corynoneura* Winnertz from East Asia, with a systematic review of the genus (Diptera, Chironomidae, Orthoclaadiinae). *Zootaxa*, **2287** : 1-44.
- HAZRA, N., S. NATH & P.K. CHAUDHURI. 2003. The genus *Corynoneura* Winnertz (Diptera, Chironomidae) from the Darjeeling-Sikkim Himalayas of India, with description of three new species. *Entomologist's monthly Magazine*, **139**: 69-82.
- HIRVENOJA, M. & E. HIRVENOJA. 1988. *Corynoneura brundini* spec. nov. Ein Beitrag zur Systematik der Gattung *Corynoneura* (Diptera, Chironomidae). *Spixiana*, Supplement **14**: 213-238.
- 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.
- MAKARCHENKO, E. & M.A. MAKARCHENKO. 2006. Chironomids of the genera *Corynoneura* Winnertz, 1846 and *Thienemanniella* Kieffer, 1919 (Diptera, Chironomidae, Orthoclaadiinae) of the Russian Far East. *Eurasian Entomological Journal*, **5** (2): 151-162.
- MAKARCHENKO, E. & M.A. MAKARCHENKO. 2010. New data on the fauna and taxonomy of *Corynoneura* Winnertz, 1846 (Diptera, Chironomidae, Orthoclaadiinae) of the Russian Far East. *Eurasian Entomological Journal*, **9** (3): 353-370 + II.
- MOUBAYED, J. & P.H. LANGTON. 2019. *Chaetocladus berythensis* sp. n., *C. calloensis* 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*, **23**: 42-59.
- MOUBAYED-BREIL, J. 2015. *Corynoneura tyrrhena* sp. n., a mountain crenophilous species occurring in the upper basin of the Restonica River in central Corsica (Diptera, Chironomidae, Orthocladiinae). *Ephemera*, **16**: 1-11.
- SASA, M. 1979. *A morphological study of adults and immature stages of 20 Japanese species of the family Chironomidae (Diptera)*. Research Report from the National Institute for Environmental Studies, **7**: 1-148.
- SÆTHER, O.A. 1980. Glossary of chironomid morphology terminology (Diptera, Chironomidae). *Entomologica Scandinavica, Supplement 14*: 1-51.
- SÆTHER, O.A. & L. KRISTOFFERSEN. 1996. Chironomids with "M-fork". A reevaluation of the *Corynoneura* group (Insecta, Diptera, Chironomidae). *Spixiana, Supplement 19* (2): 229-232.
- 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 data base at <http://www.fauna-eur.org>
- SCHLEE, D. 1968a. Phylogenetic studies on Chironomiden (Diptera) with special reference to the *Corynoneura* group. *Annales Zoologici Fennici*, **5**: 130-138.
- SCHLEE, D. 1968b. Vergleichende Merkmalsanalyse zur Morphologie und Phylogenie der *Corynoneura*-Gruppe (Diptera, Chironomidae). Zugleich eine allgemeine Morphologie der Chironomiden-Image (♂). *Stuttgarter Beiträge zur Naturkunde*, **180**: 1-150.
- TUISKUNEN, J. 1983. A description of *Corynoneura gynecera* sp. n. (Diptera, Chironomidae) from Finland. *Annales entomologica Fennici*, **49**: 100-102.
- WIEDENBRUG, S., C.E. LAMAS & S. TRIVINHO-STRIXINO. 2012. A review of the genus *Corynoneura* Winnertz (Diptera, Chironomidae) from the Neotropical Region. *Zootaxa*, **3574**: 1-61
- WIEDENBRUG, S. & S. TRIVINHO-STRIXINO. 2011. New species of the genus *Corynoneura* Winnertz (Diptera, Chironomidae) from Brazil. *Zootaxa*, **2822**: 1-40.
- WINNERTZ, J. 1846. Beschreibung einiger neuer Gattungen aus der Ordnung der Zweiflügler. *Stettiner entomologische Zeitung*, **7**: 11-20.