

***Smittia pratti* sp. n., a new riparian species from the upper basin of the Cinqueta River, Spanish Pyrenees [Diptera, Chironomidae, Orthoclaadiinae]**

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Keywords: Diptera Chironomidae, *Smittia pratti* sp. n., Pyrenees (Spain), conservation.

Male adult of *Smittia pratti* sp. n. is described on the basis of material collected by sweep net in the upper basin of the Cinqueta River (Spanish Pyrenees, NE-Spain, altitude 1561 m). A combination of some distinguishing characters found in the male adult (shape of the anal point, inferior volsella and gonostylus) shows a close morphological similarity with that of *S. scutellosetosa* Caspers, 1988 and *S. zealandiana* Moubayed-Breil & Mary, 2021. Therefore, the new species represents, here, the third member of the *scutellosetosa*-group as emended recently by MOUBAYED-BREIL & MARY (2020). The presence of ventral lobe (pars ventralis) at the basal junction of gonocoxites is unusual in the genus *Smittia* Holmgren 1869. This atypical character will easily separate the new species from its related congeners. Currently, there are 37 *Smittia* species reported from Europe. Consequently, description here of *Smittia pratti* sp. n. increases the total number in the genus to 38 valid species. The new species is only known from its type-locality. Comments on their taxonomic position and ecology are given.

***Smittia pratti* sp. n., une nouvelle espèce ripicole connue du bassin supérieur de la rivière Cinqueta, Pyrénées espagnoles [Diptera, Chironomidae, Orthoclaadiinae]**

Mots-clés: Diptera Chironomidae, *Smittia pratti* sp. n., Pyrénées (Espagne), conservation.

L'adulte mâle de *Smittia pratti* sp. n. est décrit à partir d'un matériel collecté à l'aide d'un filet entomologique dans le bassin supérieur de la rivière Cinqueta (Pyrénées espagnoles, alt. 1561 m). Une combinaison de certains caractères discriminants de l'adulte mâle (forme de la pointe anale, volselle inférieure, et gonostyle) révèle une grande similarité morphologique avec *S. scutellosetosa* Caspers, 1988 et *S. zealandiana* Moubayed-Breil & Mary, 2021. Ainsi, la nouvelle espèce représente le troisième membre du groupe-*scutellosetosa* tel qu'il a été récemment modifié par MOUBAYED-BREIL & MARY (2021). La présence d'un lobe ventral (pars ventralis) à la jonction basale des gonocoxites est inhabituelle dans le genre *Smittia* Holmgren 1869. Ce caractère atypique séparera facilement la nouvelle espèce de ses congénères proches. Cette description porte à 38 le nombre total d'espèces européennes valides du genre *Smittia*. La nouvelle espèce est pour le moment uniquement connue de sa localité-type. Des remarques taxonomiques et écologiques sont ajoutées.

1. Introduction

The larval populations of the genus *Smittia* Holmgren, 1869 include almost exclusively terrestrial, semi-terrestrial and riparian species commonly encountered in temporary habitats such like wetlands, wet soils and meadows, pools, peat bogs and wet grasses. Based on knowledge provided on the taxonomy and geographical distribution of the known *Smittia* species from Europe (EDWARDS 1929, GOETGHEBUER 1940-1950, BRUNDIN 1947, 1956, ALBU 1970, CASPERS 1988, ROSSARO 1988, CRANSTON et al. 1989, ROSSARO & DELETTRE 1992, ROSSARO & LENICIONI 2000, ROSSARO & ORENDT 2001, LANGTON & PINDER 2007, MOLLER PILLOT 2008, ASHE & O'CONNOR 2012, SÆTHER & SPIES 2013, MOUBAYED & TISSOT 2019, MOUBAYED-BREIL & MARY 2021, MOUBAYED & CLÉVENOT 2022), the genus *Smittia* comprises 37 known valid species from Europe. On the basis of some common characters found in the male adult of *S. pratti* sp. n. and that of *S. scutellosetosa* Caspers, 1988 (shape of anal point, inferior volsella and gonostylus) allowed us to consider the new species as a member of the *scutellosetosa*-group. In this paper, *Smittia pratti* sp. n. is diagnosed and described based on material collected by sweep net in the upper basin of the Cinqueta River, altitude, 1561 m (Pyrenees, NE-Spain).



Photo 1. Type-locality of *Smittia pratti* sp. n.: Cinqueta River, upper basin (Pyrenees, NE-Spain).

Photo 1. Localité-type de *Smittia pratti* sp. n. : rivière Cinqueta, cours supérieur (Pyrénées, NE-Espagne).

2. Material and methods

The studied material was collected using a sweep net in some riparian habitats bordering the upper basin of the Cinqueta River, Spanish Pyrenees (Photo 1), and then preserved in 80-85% ethanol for the taxonomic examination and description. Information on the methodology of mounting and conservation of the type and paratype material is provided in MOUBAYED-BREIL & LANGTON (2020). Morphological terminology and measurements follow those of SÆTHER (1980) and LANGTON & PINDER (2007) for the imagines.

3. Description

Smittia pratti sp. n.

Material examined

Holotype. Spain. one male adult, captured by Sweep net, upper valley of the Cinqueta River (Photo 1), NE-Spanish Pyrenees (42.660353° N; 0.368168° E); altitude 1561 m, leg. R. Acosta, 18.IX.2019.

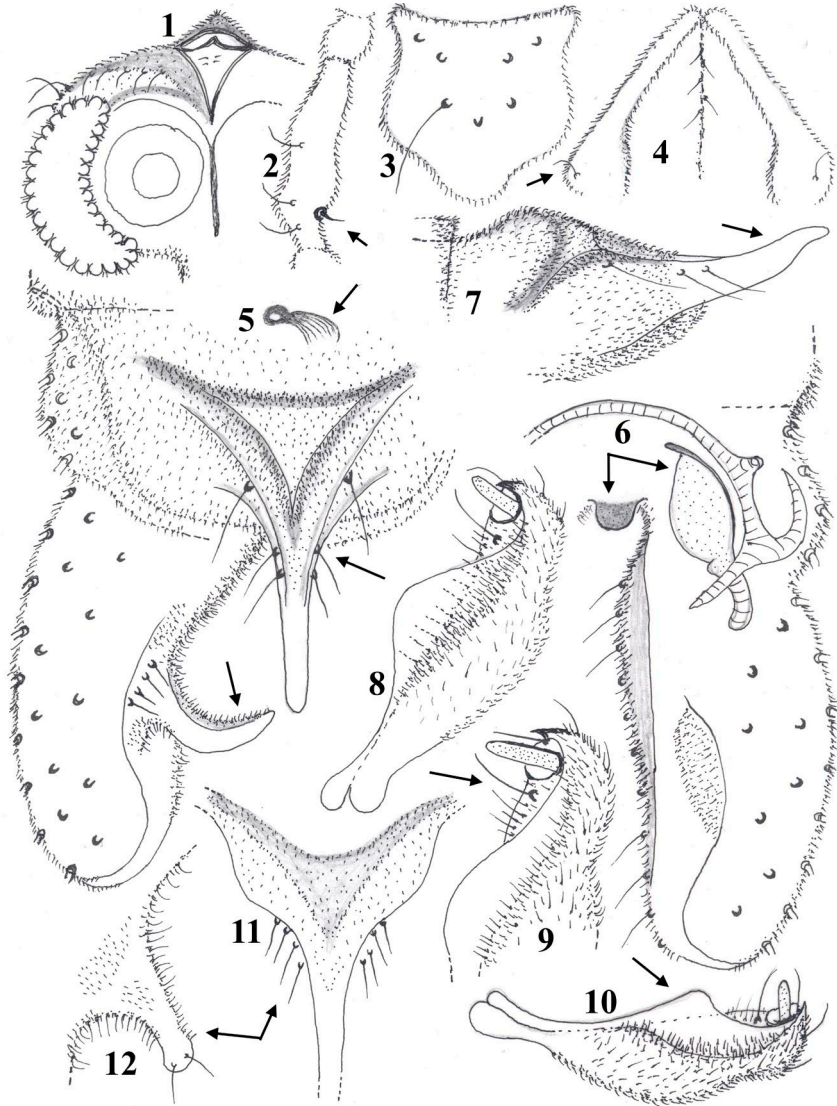
Paratype. one male adult, preserved in 80% ethanol, same locality and data as for holotype; leg. R. Acosta.

Holotype (male adult, on one slide) is deposited in the collections of the University of Barcelona, Spain.

Etymology: the species is named "*pratti*" in honour of our colleague Narcis Prat (professor emeritus at the university of Barcelona, Spain), who remains active as entomologist in preserving the biodiversity of aquatic habitats in Spain.

Diagnostic characters

Though some morphological similarities are observed between the male adult of *S. pratti* sp. n. and that of both *S. scutellosetosa* Caspers, 1988, and *S. zealandiana* Moubayed-Breil & Mary, 2021, the 3 latter species appear to belong to one and same group of species: the *scutellosetosa*-group. However, the new species can easily be distinguished by a combination of characters. Head. Eyes hairy, temporals 7. Thorax. Lobes of anteprenotum gaping, lateral anteprenotals 1, acrostichals 5, dorsocentrals 9; humeral pit present. Wing. Brachiolum with one seta, squama bare. Legs. Sensilla chaetica on tibia and tarsomeres ta₁-ta₅ of PI-PIII. Anal segment. Tergite IX broadly semi-circular to sub-rectangular, bearing a distinct rounded hump clearly visible in lateral view. Anal point very long, triangular in its proximal half, parallel-side distally; with 6 setae placed laterally (3 on each side), 2 at base and 4 in median part; sternapodeme rounded; phallapodeme well-developed, basal expansion small, aedeagal lobe ellipse-shaped. Virga consists of 5-6 curved spines. Gonocoxite with a characteristic semicircular pars ventralis (ventral lobe); apex rounded, ventral margin slightly swollen basally. Superior volsella weakly-developed. Inferior volsella digitiform, arched and projecting upwards, anterior side covered with short setae, posterior side mostly hyaline and bare, outer median part with 4 stout inwardly directed setae. Gonostylus linearly elongate; anterior side covered with short and medium sized setae, distal part with 2 stout setae located pre-apically and apically; crista dorsalis well-developed, large lobe-shaped, occupying the entire median part.



Figures 1-12. Male imago of *Smittia* spp. *S. pratti* sp. n.: head, left side (1); palpomere 3 (2); clypeus (3); lobes of anteprenotum with acrostichals (4); hypopygium in dorsal (5) and ventral view (6); tergite IX and anal point in lateral view (7); gonostylus: acute angle (8), distal part (9) and lateral view (10). *S. scutellosetosa*: anal point, basal part with lateral setae (11); inferior volsella (12). Arrows indicate some distinguishing characters.

Figures 1-12. Imago mâle de *Smittia* spp. *S. pratti* sp. n.: Tête, côté gauche (1) ; palpomere 3 (2) ; clypéus (3) ; lobes of antépronotum et soies acrosticales (4) ; hypopyge en vue dorsale (5) et ventrale (6) ; tergite IX et pointe anale en vue latérale (7) ; gonostyle : angle aigu (8), partie distale (9) et vue latérale (10). *S. scutellosetosa* : pointe anale, partie basale avec les soies latérales (11) ; volselle inférieure (12). Les flèches indiquent quelques caractères discriminants.

Male imago (n = 2; Figs 1-10)

Small sized species. Total length 2.70 mm; wing length 1.40 mm; TL/WL = 1.93. General colouration contrasting brown to dark brown; head dark brown; antenna brownish; thorax distinctly contrasting dark brown to blackish with blackish mesonotal stripes; legs and abdomen brownish; anal segment contrasting brown to blackish, tergite IX with a characteristic whitish triangular median area reaching base of the anal point.

Head. Eyes hairy; vertex and coronal area as in Fig. 1, coronal suture regularly thin, coronals 2; frontal margin with a triangular tubercle. Temporals 11-12 including 8 inner and 3-4 outer verticals. Antenna 13-segmented, 815 μm long; last flagellomere 430 μm long, stout pre-apical seta about 40 μm long; antennal groove beginning on segments 2-3; AR 1.10. Palp 5-segmented, segments 1-2 fused; length (in μm) of segments: 15, 35, 95, 125, 165; palpomere 3 (Fig. 2) with 3 sensilla clavata and one pre-apical needle-like sensilla coeloconica. Clypeus (Fig. 3) 80 μm long, 75 μm maximum width, sub-rectangular lateral sides with undulation, with 7 setae in 3 rows. Thorax. Lobes of anteprenotum (Fig. 4) evenly thick, well gaping, dorsal part rounded, atypically with only 1 anteprenotal seta; acrostichals 5, short, starting close to base of scutum; dorsocentrals 9 in one row; prealars 4 in 1 row; preepisternum bare; scutellum with 6 setae in one row; humeral pit present, weak; Wing. Brachiolum with one seta. Subcosta extending beyond fork of radius, costal expansion about 55 μm long. Number of setae on veins: R, 10-11; R₁, 3-4; R₄₊₅, 12-13; remaining veins bare; squama bare. Legs. Length (in μm) of tibial spurs: PI, 75; PII, 40 and 25; PIII, 50, 20; pseudospurs absent on tarsomeres of PI, present on tarsomeres ta₂-ta₃ of PII and tarsomere ta₂ of PIII. Sensilla chaetica present on tibia and tarsomeres ta₁-ta₅ of PI-PIII; length (μm) and proportions of prothoracic (PI), mesothoracic (PII) and metathoracic (PIII) legs as in the following table I (n = 1):

	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₅	LR	BV	SV	BR
PI	550	630	725	215	140	90	85	0,52	2,84	3,63	2.65
PII	615	575	210	140	105	70	70	0,37	3,64	5,67	1.95
PIII	535	555	275	170	155	80	80	0,50	2,81	3,96	3.10

“ 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 ape

Abdomen. Hypopygium in dorsal and ventral view (Figs 5-6), ventral view (Fig. 6) with tergite IX and anal point omitted. Tergite IX 90 μm long, 160 μm maximum width at base and about 50-60 μm in caudal part; broadly sub-rectangular, posterior margin nearly straight, dorsal margin with a low proximal hump (Fig.7); dorsal setae absent. Anal point (Figs 5, dorsal; 7, lateral) about 100 μm long, 40-50 μm maximum width at base, about 10 μm in median part; reaching tip of inferior volsella; triangular basally and parallel-sided in remaining part; apex rounded; in dorsal view linearly elongate, in lateral view winding distally; with 6 characteristic setae located laterally, 2 basally, 4 medially, basal and median parts densely covered with microtrichia, distal half hyaline and bare. Laterosternite IX with 12 lateral setae (6 on each side). Sternapodeme and phallapodeme (Fig. 6); transverse sternapodeme semi-circular, not projecting orally; aedeagal lobe of phallapodeme well-developed, ellipse-shaped. Gonocoxite 170 μm long, rounded apically; dorsal side (Fig. 5), with a characteristic cluster of 4 setae located at base of inferior volsella; ventral side (Fig. 6) with 11 stout setae on inner margin; basal junction of gonocoxites with a characteristic and specific semicircular pars ventralis covered with very fine and

dark microtrichia. Virga (Fig. 5) 10 μm long, composed of 6-7 curved spines. Inferior volsella (Fig. 5) about 25 μm long, 10-12 μm maximum width at base; typically digitiform to finger-shaped, upwardly projecting in its distal half; anterior side with short setae, posterior side hyaline and bare. Gonostylus (Figs 8-10) about 85 μm long, 15-20 μm maximum width; linearly elongate; anterior margin nearly straight, posterior margin rounded; anterior side densely covered with setae including 2-3 longer on pre-apical part; crista dorsalis well-developed, consists of a large characteristic median lobe occupying 80% of the anterior side; megaseta about 10 μm long, straight and well-developed, located apically. HV = 3.18; HR = 2.0.

Female adult, pupal exuviae and larva: unknown

4. Differential diagnosis

Based on some common characters found in the male adult (shape of anal point, inferior volsella and gonostylus), *S. scutellosetosa* Caspers, 1988, *S. zealandiana* Moubayed-Breil & Mary, 2021 are considered as the closest species to *S. pratti* sp. n. These 3 species appear to key into a same and one group of *Smittia* species: the *scutellosetosa*-group. Though a strong similar morphological affinity is observed between the latter 3 species, *S. pratti* sp. n. can be separated from the 2 other species on the basis of a combination of distinguishing characters as highlighted successively in the following differential diagnosis and the key to male adults of the *scutellosetosa*-group.

Differential diagnosis

- Eyes pubescent as in *S. scutellosetosa* and *S. zealandiana*;
- Frontal tubercle triangular (Fig. 1) as in *S. scutellosetosa* (Fig. 3; CASPERS 1988, Fig. 1), is semi-circular in *S. zealandiana*;
- Lobes of antepronotum gaping (Fig. 4) as in the 2 other species;
- Antepronotals with only 1 seta (Fig. 4), with 2 setae in *S. scutellosetosa* and 5 in *S. zealandiana*;
- Membrane of wing not hairy as in *S. scutellosetosa*, while is hairy in *S. zealandiana*;
- Virga consists of 8-9 curved spines (Fig. 5), is differently figured in the 2 other species;
- Anal point with 2 lateral setae at base (Fig. 5), bearing 8 setae in *S. scutellosetosa* (Fig. 11) and *S. zealandiana* (in MOUBAYED-BREIL & MARY 2021, Fig. 8);
- Inferior volsella bare (Fig. 5), is setose in *S. scutellosetosa* (Fig. 12; CASPERS 1988, Fig. 2) and *S. zealandiana* (in MOUBAYED-BREIL & MARY 2021, Figs 8, 11);
- Gonostylus and crista dorsalis (Figs 8-10), are differently figured in *S. scutellosetosa* (in CASPERS 1988, Figs 1-2) and *S. zealandiana* (in MOUBAYED-BREIL & MARY 2021, Figs 13-14).

Key to known male adult of the *scutellosetosa*-group

1. Membrane of wing hairy (MOUBAYED-BREIL & MARY 2021, Fig. 7); anal point cup-like at base, apex spatulate, median part bare; inferior volsella upwardly projecting, covered with setae at base, apex pointed and bare (MOUBAYED-BREIL & MARY 2021, Figs 8, 11) ***S. zealandiana***

- Membrane of wing not hairy; anal point triangular, with 8 lateral setae at base, median part with 4 setae or bare; inferior volsella upwardly or downwardly projecting, apex pointed or spatulate, setose at base or at apex **2**
- 2.** Anal point with 4 setae on median part (Fig. 5); pars ventralis present (Fig. 6); inferior volsella upwardly projecting, pointed apically, apex bare (Fig. 5) ***S. pratti* sp. n.**
- Anal point without setae on median part (Fig. 11); inferior volsella spatulate apically, apex with 2 characteristic setae (Fig. 12) ***S. scutellosetosa***

5. Ecology and geographical distribution

- Ecology: Despite large investigation in the upper basin of the Cinqueta River, only 2 male adults of *S. pratti* sp. n. were collected, which were captured along semiterrestrial and riparian habitats bordering the river (Photo 1). Emergence is observed between April and June.

- Geographical distribution of *S. pratti* sp. n. is restricted to its type-locality in Spanish Pyrenees, where the type-material was collected. The presence of some atypical characters (chaetotaxy of anal point and shape of inferior volsella), allowed us to consider this new species as a local 'Pyrenean biogeographic element', which could likely be more widespread in similar mountainous areas located in both sides of Spanish and French Pyrenees. This new species may be biogeographic representative of global warming and local climate change, and therefore deserve greater consideration and conservation measures.

- Associated semiterrestrial species, encountered in the Cinqueta river basin and the same locality with *S. pratti* sp. n., include: *Hydrosmittia brevicornis* (Strenzke, 1950); *H. oxoniana* (Edwards, 1929); *H. ruttneri* (Strenzke & Thienemann, 1942); *H. sp. 1*; *Limmophyes asquamatus* Søgaard Andersen, 1937; *L. bidumus* Sæther, 1990; *L. cranstoni* Sæther, 1990; *L. edwardsi* Sæther, 1990; *L. gelasinus* Sæther, 1990; *L. minimus* (Meigen, 1818); *L. ninae* Sæther, 1975; *Pseudosmittia angusta* (Edwards, 1929); *P. obtusa* (Strenzke, 1960); *P. trilobata* (Edwards, 1929); *Smittia contingens* Walker, 1856; *S. foliosa* (Kieffer, 1921); *S. leucopogon* (Meigen, 1804); *S. nudipennis* (Goetghebuer, 1913); *S. paranudipennis* Brundin, 1947.

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References

- ALBU, P. 1970. Chironomide din Carpatii Romanesti (I). *Studdi si Cercetari de Biologie, Série de Zoologie*, **18** (1): 193-205.
- 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. 1947. Zur Kenntnis Schwedischen Chironomiden. *Arkiv för Zoologi*, **39** A3: 1-95.
- BRUNDIN, L. 1956. Zur Systematic der Orthocladiinae (Diptera, Chironomidae). *Report of the Institute of Freshwater Research, Drottningholm*. **37**: 5-185.

- CASPERS, N. 1988. Zwei neue *Smittia*-Arten aus dem süddeutschen Raum. *Spixiana Supplement*, **14**: 175-181.
- 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.
- EDWARDS, F. W. 1929. British non-biting midges (Diptera, Chironomidae). *Transactions of the Entomological Society of London*, **77**: 279-430.
- GOETGHEBUER, M. 1940-1950. Tendipedidae (Chironomidae). f) Subfamily Orthoclaadiinae. A. Die Imagines. In Lindner, E. (Hrsg.): *Die Fliegen der Palaearktischen Region*. **13g**: 1-208 + XXIV Figs.
- 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**.
- MOLLER PILLOT, H.K.M. 2008. Identification and ecology of the genus *Smittia* Holmgren in the Netherland (Diptera, Chironomidae). *Tidjschrift voor Entomologie* **151** (2): 245-270.
- MOUBAYED, J. & P. CLÉVENOT. 2022. *Smittia balmea*, *S. corsicana* and *S. tyrrhena* spp. n., three new semiterrestrial species from continental France and Corsica (Diptera, Chironomidae, Orthoclaadiinae). *Ephemera*, **23** (1) : 29-42.
- MOUBAYED, J. & B. TISSOT. 2019. *Smittia remoraya* sp. n. a new semi-terrestrial species inhabiting alkaline wet sedge meadows in north eastern France (Diptera, Chironomidae, Orthoclaadiinae). *Ephemera*, **20** (2): 89-97.
- MOUBAYED-BREIL, J. & N. MARY. 2021. *Smittia zealandiana* sp. n. a new semi-aquatic species occurring in the moss carpet of riparian habitat in Mont Panié, New Caledonia (Diptera, Chironomidae, Orthoclaadiinae). *Ephemera*, **22** (1): 11-21.
- ROSSARO, B. 1988. Revisione del genera *Smittia* Holmgren (Diptera, Chironomidae). 1a Nota (1). *Arti XV Congresso Nazionale Italiana Entomologica, L'Aquila*: 303-310.
- ROSSARO, B. & Y. DELETTRE. 1992. Description of *Smittia celtica* sp. n. (Diptera, Chironomidae). *Annales de la Société Entomologique de France (N.S.)*, **28** (4): 365-370.
- ROSSARO, B. & V. LENCIONI. 2000. Revision of the genus *Smittia* Holmgren, 1869 (Diptera, Chironomidae, Orthoclaadiinae), 2nd note. *Bollettino di Zoologia Agraria e Bachicoltura (Serie II)*, **32** (2): 97-105.
- ROSSARO, B. & C. ORENDT. 2001. A new *Smittia* species from the Bavarian Alps (Diptera, Chironomidae). *Bollettino della Società Entomologica Italiana*, **133** (1): 55-60.
- SÆTHER, O.A. 1980. Glossary of chironomid morphology terminology (Diptera, Chironomidae). *Entomologica Scandinavica, Supplement*. **14**: 1-51.
- SÆTHER, O.A. & M. SPIES. 2013. Fauna Europaea: Chironomidae. In Beuk, P. & T. Pape (eds): *Fauna Europaea: Diptera Nematocera. Fauna Europaea version 2.6*. Internet data base at <http://www.faunaeur.org> [accessed February 2015].