

***Smittia remoraya* sp. n., a new semiterrestrial species  
inhabiting alkaline wet sedge meadows  
in north eastern France  
[Diptera, Chironomidae, Orthoclaadiinae]**

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Keywords: *Smittia remoraya* sp. n., Diptera Chironomidae, alkaline peat bogs, NE-France, conservation.

The male adult of *Smittia remoraya* sp. n. (= *S. sp. 1*, in MOUBAYED-BREIL et al. 2018) is diagnosed and described based on material collected by Malaise traps placed close to alkaline wet sedge meadows and peat bogs located in the National Nature Reserve of Remoray Lake (NE-France). A combination of some atypical characters found in the male adult (atypical shape of gonocoxite, inferior volsella and gonostyle) allowed us to consider this new species as a member of a separate group of the genus *Smittia* (the *antelobata*-group). Additional taxonomic notes including illustrations (arculus, anal point, inferior volsella, virga and gonostylus) of some known and not yet described species are also given. Consequently, the genus *Smittia* Holmgren, 1869 is represented by 37 species in Europe and by 30 taxa/species in continental France including 21 valid species and 9 undescribed taxa (*S. sp. 1* to *S. sp. 9*). The new species is only known from its type-locality (NE-France). Taxonomic remarks on some known taxa/species from France are provided.

***Smittia remoraya* sp. n., une nouvelle espèce semi-terrestre connue de tourbières alcalines situées au nord-est de la France [Diptera, Chironomidae, Orthoclaadiinae]**

Mots-Clés: *Smittia remoraya* sp. n., Diptera Chironomidae, tourbières alcalines, NE-France, conservation.

L'adulte mâle de *Smittia remoraya* sp. n. (= *S. sp. 1*, dans MOUBAYED-BREIL et al. 2018) est décrit à partir d'un matériel collecté grâce à des tentes Malaise placées non loin de prairies humides (Cariçaises) et de tourbières alcalines dans la réserve naturelle nationale du Lac de Remoray (NE-France). Une combinaison de certains caractères atypiques de l'adulte mâle (forme du gonocoxite, de la volselle inférieure et du gonostyle) nous permet de considérer que cette nouvelle espèce constitue avec *S. antelobata* Albu, 1970, un groupe à part dans le genre *Smittia* (gr. *antelobata*). Des données taxonomiques supplémentaires incluant des illustrations (arculus, pointe anale, volselle inférieure, virga et gonostyle) d'espèces connues et d'autres encore non décrites sont également proposées. Cette découverte porte actuellement à 37 le nombre d'espèces du genre *Smittia* Holmgren, 1869 en Europe et à 30 les taxons/espèces en France continentale dont 21 espèces valides et 9 (*S. sp. 1* à *S. sp. 9*) taxons encore non décrits. La nouvelle espèce est connue uniquement de sa localité-type (NE-France). Des remarques taxonomiques sur certains taxons/espèces connus de France sont proposées.

## 1. Introduction

The genus *Smittia* Holmgren, 1869 includes almost exclusively terrestrial and semiterrestrial species commonly encountered in temporary habitats and wetlands including wet soils, pools, peat bogs and wet grasses. Based on knowledge provided on the taxonomy, geographical distribution and ecology of the known *Smittia* species from Europe (EDWARDS 1929, GOETGHEBUER 1940-1950, BRUNDIN 1947 and 1956, ALBU 1970, HIRVENOJA 1973, CASPERS 1988, ROSSARO 1988, MOUBAYED 1989, CRANSTON et al. 1989, SERRA-TOSIO & LAVILLE 1991, ROSSARO & DELETTRE 1992, ROSSARO & LENCIONI 2000, ROSSARO & ORENDT 2001, LANGTON & PINDER 2007, MOLLER PILLOT 2008, ASHE & O'CONNOR 2012, SÆTHER & SPIES 2013, MOUBAYED-BREIL & ASHE 2016), the genus *Smittia* comprises 36 known valid species from Europe, of which 29 taxa/species are reported from continental France including 20 valid species and 9 undescribed taxa (*S. sp. 1* to *S. sp. 9*). In this paper, *Smittia remoraya* sp. n. (= *S. sp. 1*, in MOUBAYED-BREIL et al. 2018) is diagnosed and described as 30<sup>th</sup> species from this country, based on material collected by Malaise traps placed close to alkaline wet sedge meadows and peat bogs located in the Nature Reserve of Remoray Lake (NE-France). Four of the latter 9 taxa (*S. sp. 2* to *S. sp. 5*) occur in high altitude areas (altitude 2000-2200 m), while the remaining five taxa (*S. sp. 1* and *S. sp. 6* to *S. sp. 9*) are encountered in lower wetlands habitats. Illustrations with additional taxonomic notes (pubescence of eyes; presence/absence of acrostichals; shape of: arculus, tergite IX and anal point, virga, inferior volsella, gonostylus) of some known taxa/species from France are also given.

## 2. Material and methods

The studied material of male adults was collected exclusively by Malaise traps placed close to each of the most representative habitats of the Nature Reserve of Remoray Lake. Preserved male adult in 80% ethanol, was cleared of musculature in 90% lactic acid (head, thorax, abdomen and anal segment) for about 60 to 80 minutes; this can be left overnight at room temperature without any detrimental effect or damage. When clearing was complete the specimens were washed in two changes of 50-60% ethanol to ensure that all traces of lactic acid were removed. The holotype and paratypes were mounted in polyvinyl lactophenol. Before the final slide mountings (dorsally) of the type material, the hypopygium including the tergite IX, the anal point, the gonocoxite and the gonostylus, were viewed ventrally and laterally to examine and draw from both sides all the necessary details of the species. The proximal part of the abdomen and the halteres of the male adults were preserved in 85% ethanol for an eventual DNA analysis. Morphological terminology and measurements follow those of SÆTHER (1980) and LANGTON & PINDER (2007).

## 3. Description

### *Smittia remoraya* Moubayed, sp. n.

#### Material examined

Holotype. France. 1 male adult, leg. B. Tissot, Malaise traps, alkaline sedge meadows and peat bogs, upper valley of the Doubs River, National Nature Reserve of Remoray Lake, north eastern France (46.7717° N; 6.2632° E); altitude 800-850 m, 12.IV.2019.

Paratypes (leg. B. Tissot). 4 male adults including 2 mounted on two slides and 2 preserved in 80% ethanol, same locality and data as for holotype; 3 male adults preserved in ethanol, wet soil and temporary pools, 30.IV.2018; 4 male adults preserved in ethanol, sedge meadows, 22.V.2019.

Holotype (male adult, on 1 slide) is deposited in the collections of the Zoologische Staatssammlung of (ZSM), Munich, Germany. The remaining paratypes are deposited in the collection of the senior author.

**Etymology:** the species name “*remoraya*” belongs to the Lake of Remoray (NE-France) where the type material was collected.



Photo 1. Type-locality of *Smittia remoraya* sp. n., picture showing the alkaline wet sedge meadows and peat bogs at the National Nature Reserve of Remoray Lake. Photo B. Tissot (August 2018).

Photo 1. Localité type de *Smittia remoraya* sp. n., photographie illustrant les prairies humides (Cariçaie) et tourbières alcalines situées dans la Réserve naturelle nationale du Lac de Remoray. Photo B. Tissot (août 2018).

### Diagnostic characters

Based on the unusual shape of the inferior volsella and gonostylus, *S. remoraya* sp. n. appears to belong to a separate group of *Smittia* species. However, the new species can easily be distinguished from other related species by a combination of characters: eyes naked; temporals about 11-12; lobes of antepnotum not gaping; acrostichals absent; humeral pit well-developed; squama 18-21; tergite IX broadly semi-circular to sub-rectangular, bearing a distinct rounded hump clearly visible in lateral view, posterior margin with 4 setae located close to base of anal point (2 on each side); anal point long, triangular and sharply pointed apically, with 4 setae placed laterally (2 on each side of its base); sternapodeme with lateral base triangle-like shaped, phallapodeme larger and undulated at base; gonocoxite with 2 widely separated ventral lobes; inferior volsella broad sub-triangle shaped with mostly hyaline apex, slightly projecting downwards apically and ending

with a rounded apex, short dorsal setae present basally and medially; virga consists of 2 short spines; gonostylus bulbous medially, anterior side with a cluster of dorsal and ventral setae, posterior side rounded bearing a distinct hyaline thin area along the distal margin; crista dorsalis composed of 2 lobes, proximal one larger and conspicuous, distal one is smaller and less distinct; megaseta well-developed.

### Male imago

(= *Smittia* sp. 1, in MOUBAYED-BREIL et al. 2018)

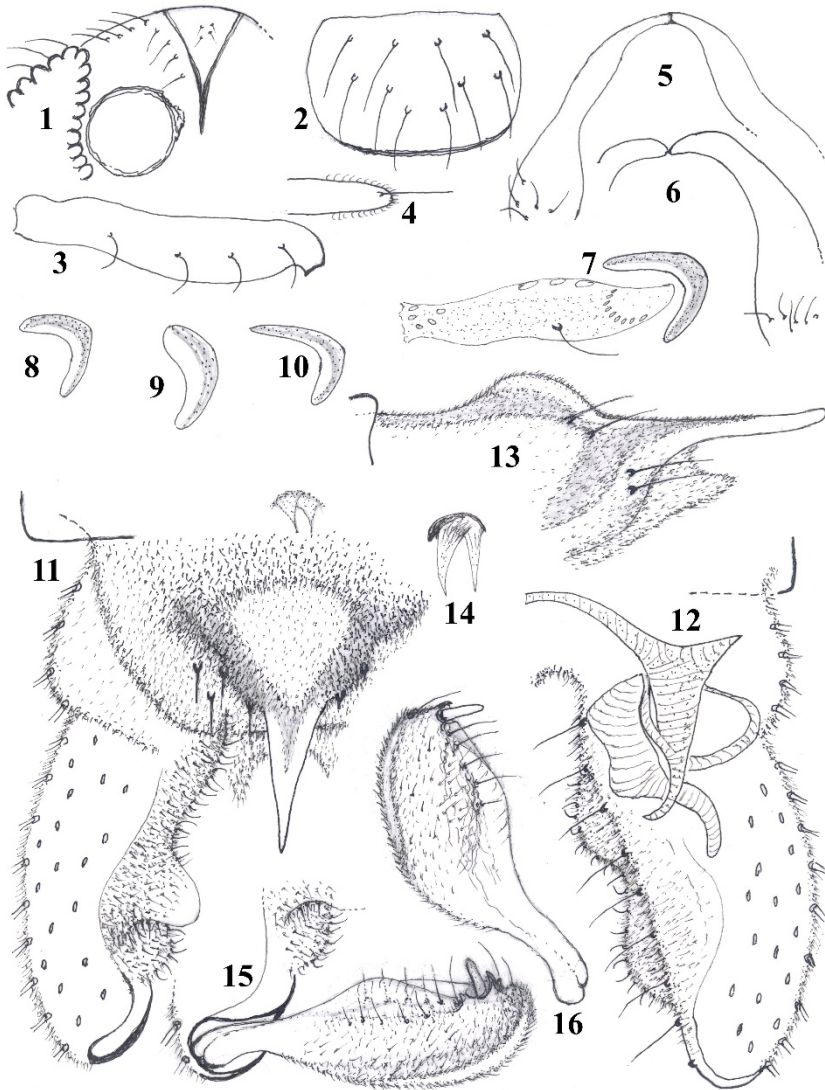
(n = 3; Figs 1-5, 7, 11-19)

General colouration contrasting brown to blackish; head dark brown; antenna brown; thorax distinctly contrasting dark brown to blackish with blackish mesonotal stripes; legs dark brown; abdomen dark brown; anal segment contrasting brown to blackish, tergite IX bearing a whitish median area. Head. Vertex and coronal area as in Fig. 1, coronals 2, suture regularly thin; eyes bare, inner lateral margin of eye naked; temporals consist of 11-12 setae including 8 inner and 3-4 outer verticals. Clypeus (Fig. 2) 85  $\mu\text{m}$  long and 125  $\mu\text{m}$  maximum width, nearly rectangular bearing 10 setae in 3 rows. Palp 5-segmented, segment 1 weakly developed; segments 1-2 fused and contrasting, separated by a characteristic blackish suture; length (in  $\mu\text{m}$ ) of segments: 15-20, 55, 135, 125 175 (third segment longer than the fourth); palpomere 3 (Fig. 3) with 4 sensilla clavata, sensilla coeloconica absent. Antenna 13-segmented, 655-665  $\mu\text{m}$  long, linearly elongated; last flagellomere (Fig. 4) 315-320  $\mu\text{m}$  long, with an apical stout seta nearly parallel-sided and weakly clubbed apically, with numerous apical sensillae chaeticae; antennal groove clearly visible, beginning on segment 3-4 and reaching ultimate flagellomere, regularly wide on segments 3-4 to 13 and becoming weaker on distal half of segment 13; AR 0.93-0.95. Thorax. Lobes of anteprepronotum (Fig. 5) not gaping, anteprepronotals 5; acrostichals absent; dorsocentrals 9-10 in one row; humeral pit well-developed, semi-circular, contrasting and bearing dark spots; prealars 4 in one row, setae located close to the humeral suture; preepisternum bare; scutellum with 5-6 setae. Wing. Brachiolium and arculus (Fig. 7), brachiolium with 1 seta, arculus forked at a right angle; membrane lacking punctuation; number of setae on veins: R, 7-9; remaining veins bare; squama with 18-20 setae, squamal area with dense macrotrichia inserted in a proclinate distribution pattern. Legs. Sensilla chaetica present on tibia and tarsomeres  $\text{ta}_1$ - $\text{ta}_5$  of PI-PIII; length (in  $\mu\text{m}$ ) of tibial spurs: PI, 75; PII, 35 and 30; PIII, 70; pseudospurs absent on tarsomeres of PI, present on tarsomeres  $\text{ta}_2$ - $\text{ta}_3$  of PII and tarsomere  $\text{ta}_2$  of PIII; length ( $\mu\text{m}$ ) and proportions of prothoracic (PI), mesothoracic (PII) and metathoracic (PIII) legs as table I.

	fe	ti	ta <sub>1</sub>	ta <sub>2</sub>	ta <sub>3</sub>	ta <sub>4</sub>	ta <sub>5</sub>	LR	BV	SV	BR
PI	925	1035	765	480	340	220	155	0,74	2,45	2,96	2.30
PII	965	950	610	310	220	140	135	0,57	3,30	3,70	1.75
PIII	1060	1150	680	390	275	155	140	0,75	2,67	2,79	2.10

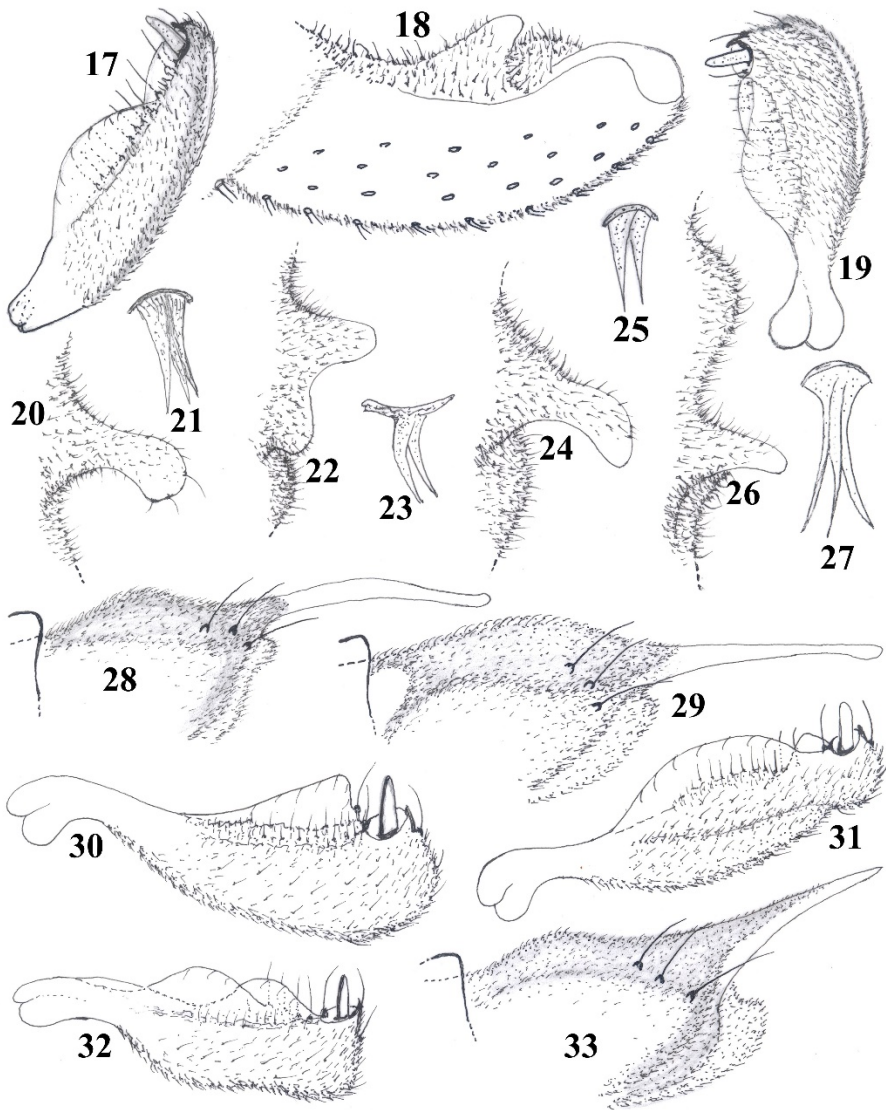
Table I. Male adult of *S. remoraya* sp. n. Length ( $\mu\text{m}$ ) and proportions of prothoracic (PI), mesothoracic (PII) and metathoracic (PIII) legs.

“ LR = Length of tarsomere  $\text{ta}_1$  divided by length of tibia (ti); BV = Combined length of femur (fe), tibia and  $\text{ta}_1$  divided by combined length of tarsomeres  $\text{ta}_2$ - $\text{ta}_5$ ; SV = Ratio of femur plus tibia to tarsomere  $\text{ta}_1$ ; BR = Ratio of longest seta of  $\text{ta}_1$ , divided by minimum width of  $\text{ta}_1$ , measured one third from apex.”



Figures 1-16. Male imago of *Smittia* spp. *S. remoraya* sp. n.: head (left side), vertex, coronal area and temporals (1); clypeus (2); palpomere 3 (3); apex of last flagellomere of antenna (4); lobes of anteprepronotum (5). *S. superata*: lobes of anteprepronotum (6). *S. remoraya* sp. n.: brachiolum and arculus (7). Arculus of: *S. pratorum* (8); *S. superata* (9); *S. sp. 2* (10). *S. remoraya* sp. n.: hypopygium in dorsal (11) and ventral view (12); lateral view of tergite IX and anal point (13); gonostylus in dorsal (15) and ventral view (16).

Figures 1-16. Imago mâle de *Smittia* spp. *S. remoraya* sp. n.: tête (côté gauche), vertex, aire coronale et soies temporales (1); clypeus (2); palpomère 3 (3); extrémité du dernier segment antennaire (4); lobes de l'antépronotum (5). *S. superata*: lobes de l'antépronotum (6). *S. remoraya* sp. n.: brachiolum et arculus (7). Arculus de: *S. pratorum* (8); *S. superata* (9); *S. sp. 2* (10). *S. remoraya* sp. n.: hypopyge, vues dorsale (11) et ventrale (12); tergite IX et pointe anale, vue latérale (13); gonostyle, vues dorsale (15) et ventrale (16).



Figures 17-33. Male imago of *Smittia* spp. *S. remoraya* sp. n.: gonostylus (at acute angle, 17); gonocoxite and inferior volsella in lateral view (18); gonostylus, lateral (19). Inferior volsella and virga of: *S. scutellosetosa* (20-21); *S. sp. 6* (22-23); *S. sp. 7* (24-25); *S. sp. 8* (26-27). Lateral view of tergite IX and anal point of: *S. sp. 6* (28); *S. sp. 7* (29). Gonostylus of: *S. sp. 6* (30); *S. sp. 7* (31); *S. sp. 8* (32). *S. stercoraria*: tergite IX and anal point, lateral (33).

Figures 17-33. Imago mâle de *Smittia* spp. *S. remoraya* sp. n.: gonostyle (selon un angle aigu, 17); gonocoxite et volselle inférieure, vue latérale (18); gonostyle, vue latérale (19). Volselle inférieure et virga de: *S. scutellosetosa* (20-21); *S. sp. 6* (22-23); *S. sp. 7* (24-25); *S. sp. 8* (26-27). Tergite IX et pointe anale, vue latérale de: *S. sp. 6* (28); *S. sp. 7* (29). Gonostyle de: *S. sp. 6* (30); *S. sp. 7* (31); *S. sp. 8* (32). *S. stercoraria*: tergite IX et pointe anale, vue latérale (33).

Abdomen. Hypopygium in dorsal and ventral view (Figs 11-12), ventral view with tergite IX and anal point removed. Tergite IX broadly semi-circular to sub-rectangular, with a straight posterior margin, dorsomedian area with a triangular whitish area, which belongs to a distinct rounded hump clearly visible in lateral view (Figs 11, 13); caudal area with 4 setae located near the base of anal point (2 on each side). Laterosternite IX with 8-9 setae inserted laterally (4-5 on each side). Sternapodeme and phallapodeme (Fig. 12), transverse sternapodeme slightly projecting orally, lateral base triangular and projecting laterally, coxapodeme much wider at base; phallapodeme undulated and distinctly larger at base. Gonocoxite in dorsal (Fig. 11), ventral (Fig. 12) and lateral view (Fig. 18), 230  $\mu\text{m}$  long, 65  $\mu\text{m}$  maximum width (including inferior volsella), ventral inner margin (Fig. 12) with 2 large lobes and 9 stout setae. Inferior volsella (Figs. 11, dorsal; 18, lateral) about 65  $\mu\text{m}$  long and 50  $\mu\text{m}$  maximum width at base, large lobe-like shaped and projecting inwards, hyaline apically; posterior margin with a row of 5-6 stoutest setae bent downwards. Virga (Figs 11, 14) consists of 2 large spines (not well visible in some specimens). Gonostylus in dorsal (Figs 15, 17), ventral (Fig. 16) and lateral view (Fig. 19), 115  $\mu\text{m}$  long and 30-40  $\mu\text{m}$  maximum wide, bulbous medially, anterior side with a cluster of dorsal and ventral orally directed setae; posterior side rounded and slightly projecting apically, a hyaline area is linearly extended close to the posterior margin; crista dorsalis consists of 2 lobes (Figs 15-17, 19), proximal one larger, distal one much lower; megaseta well-developed.

#### Larva

Unknown.

## 4. Taxonomic remarks

*S. antelobata* Albu, 1970 is the closest species to *S. remoraya* sp. n. based on the unusual shape of both inferior volsella and gonostylus. These two species appear to key into a separate group of the genus *Smittia*: the *antelobata*-group. However, *S. remoraya* sp. n. can be distinguished from other members of *Smittia* species by the following differentiating characters:

- eyes naked as in *S. leucopogon* (Meigen, 1804), *S. pratorum* (Goetghebuer, 1927) and *S. rostrata* Goetghebuer in Schmölzer, 1962, while are pubescent in *S. alpicola* Goetghebuer, 1941, *S. aterrima* (Meigen, 1818), *S. nudipennis* (Goetghebuer, 1913), *S. paranudipennis* Brundin, 1947 and *S. sp. 6*;

- acrostichals absent as in *S. leucopogon*, *S. rostrata* and *S. sp. 6*, while are present in *S. alpilonga* Rossaro & Lencioni, 2000, *S. aterrima*, *S. durandae* Moubayed, 1989, *S. nudipennis*, *S. paranudipennis* and *S. rupicola* (Kieffer, 1923);

- lobes of antepronotum not gaping (Fig. 5), are distinctly gaping in *S. alpilonga*, *S. aterrima*, *S. superata* Goetghebuer, 1939 (Fig. 6) and *S. sp. 6*;

- humeral pit well-developed as in *S. pratorum* and *S. rostrata*, while is absent (or weakly-developed) in *S. leucopogon*, *S. rupicola* and *S. paranudipennis*;

- arculus forked at a right angle (Fig. 7), is differently shaped in *S. pratorum* (Fig. 8), *S. superata* (Fig. 9) and *S. sp. 2* (Fig. 10);

- rounded hump on tergite IX (Fig. 13), is lacking in *S. sp. 6* (Fig. 28), *S. sp. 7* (Fig. 29) and *S. stercoraria* Rossaro & Lencioni, 2000 (Fig. 33);

- virga consists of 2 large spines (Figs 11, 14), is otherwise shaped in *S. scutellosetosa* (Fig. 21), *S. sp. 6* (Fig. 23), *S. sp. 7* (Fig. 25) and *S. sp. 8* (Fig. 27);
- inferior volsella broad triangle-like shaped (Figs. 11, 18), is differently figured in *S. scutellosetosa* Caspers, 1988 (Fig. 20), *S. sp. 6* (Fig. 22), *S. sp. 7* (Fig. 24) and *S. sp. 6* (Fig. 26);
- gonostylus (Figs 15-17, 19) and crista dorsalis, are differently figured in *S. sp. 6* (Fig. 30), *S. sp. 7* (Fig. 31) and *S. sp. 8* (Fig. 32).

## 5. Ecology and geographical distribution

- Ecology: male adults were collected close to alkaline wet sedge meadows and peat bogs. Emergence is observed between April and June.

- Knowledge of geographical distribution of *S. remoraya* sp. n. is presently restricted to its type-locality (National Nature Reserve of Remoray Lake, NE-France).

- Associated semiterrestrial and subaquatic species encountered in the same locality with *S. remoraya* sp. n. include: *Acricotopus lucens* (Zetterstedt, 1850); *Gymnometriocnemus brumalis* (Edwards, 1929); *G. sp. A*; *Hydrobaenus conformis* (Holmgren, 1869); *H. lugubris* (Fries, 1830); *Hydrosmittia brevicornis* (Strenzke, 1950); *H. oxoniana* (Edwards, 1929); *Limnophyes bidumus* Sæther, 1990; *L. difficilis* Brundin, 1947; *L. gelasinus* Sæther, 1990; *L. habilis* Walker, 1856; *L. pumilio* (Holmgren, 1869); *Pseudosmittia angusta* (Edwards, 1929); *P. obtusa* (Strenzke, 1960); *P. trilobata* (Edwards, 1929); *Smittia alpicola*; *S. aterrima*; *S. contingens* Walker, 1856; *S. foliosa* (Kieffer, 1921); *S. pratorum*; *S. reissi* Rossaro & Orendt, 2001; *S. rupicola*; *S. scutellosetosa*; *S. stercoraria*; *S. superata*.

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