

***Polypedilum (Uresipedilum) bernardae* sp. nov.
and *P. (Ur.) claudei* sp. nov., two new species
from eastern France
[Diptera, Chironomidae]**

by Joel MOUBAYED-BREIL

Freshwater & Marine biology, 10 rue des Fenouils, F-34070 Montpellier, France
joelmb34@free.fr

Keywords: Diptera, Chironomidae, *Polypedilum*, subgenus *Uresipedilum*, new species, E-France.

Polypedilum (Uresipedilum) bernardae sp. nov. and *P. (Ur.) claudei* sp. nov. are described based on male adults collected by Malaise traps placed close to some peat bogs located in eastern France. Some atypical characters found in the male adult (segment VIII tapered basally; shape and chaetotaxy of: tergite IX, anal point, superior volsella and inner process, inferior volsella, gonostylus) allowed us to consider the two new species as local biogeographic elements. The first one belongs to a separate sub-group, while the second is keyed close to *P. tissoti* Moubayed-Breil & Langton, 2020. Currently, the subgenus *Uresipedilum* is represented by three species in France and Europe: *P. convictum* (Walker, 1856), *P. cultellatum* Goetghebuer, 1931 and *P. tissoti*. The two new species are known only from their type-locality in E-France. Comments on their taxonomic position with key to known male adults from Europe are provided.

***Polypedilum (Uresipedilum) bernardae* sp. nov. et *P. (Ur.) claudei* sp. nov., deux nouvelles espèces connues de l'est de la France [Diptera, Chironomidae]**

Mots-Clés: Diptera Chironomidae, *Polypedilum*, subgenus *Uresipedilum*, nouvelles espèces, France.

Polypedilum (Uresipedilum) bernardae sp. nov. et *P. (Ur.) claudei* sp. nov. sont décrits à partir d'un matériel collecté à l'aide de tentes Malaise placées non loin de tourbières d'une Réserve naturelle de l'est de la France. Certains caractères atypiques de l'adulte mâle (segment VIII effilé à sa base, forme et chaetotaxie du tergite IX, pointe anale, volselle supérieure et appendice intérieur, volselle inférieure, gonostyle) ont permis de considérer ces deux nouvelles espèces comme des éléments représentatifs sur le plan biogéographique local. La première appartient à un sous-groupe à part, la seconde est proche de *P. tissoti* Moubayed-Breil & Langton, 2020. *P. (Ur.) bernardae* sp. nov. et *P. (Ur.) claudei* sp. nov. ne sont connues que de leur localité-type, et portent à 5 le nombre d'espèces du sous-genre *Uresipedilum* connues en France et en Europe. Des commentaires sur leur position taxonomique avec des clés d'identification se rapportant aux adultes mâles d'espèces connues d'Europe sont proposés.

1. Introduction

Polypedilum (Uresipedilum) bernardae sp. nov. and *P. (Ur.) claudei* sp. nov. are diagnosed and described on the basis of male adults collected by Malaise traps placed near some aquatic habitats (peat bogs and wet sedge meadows of Vurpillières and Crossat, Photo 1) located in the

National Nature Reserve of Remoray Lake (E-France). A combination of some unusual characters found in the male adult of the two new species (segment VIII tapered basally; shape and chaetotaxy of: tergite IX, anal point, superior volsella and inner process, inferior volsella, gonostylus) allowed us to consider them as local biogeographic elements. While *P. bernardae* sp. nov. belongs to a separate sub-group, *P. claudei* sp. nov. directly keys close to *P. tissoti* Moubayed-Breil & Langton, 2020.

Data on the taxonomy, key for identification and geographical distribution for known *Polypedilum* (*Uresipedilum*) species worldwide (GOETGHEBUER 1937, TOWNES 1945, FREEMAN 1958, LEHMANN 1971, SHILOVA 1976, ALBU 1980, ROSSARO 1984, CRANSTON et al. 1989, SASA 1989, NIITSUMA 1992, SASA & KIKUCHI 1995, HARRISON 1996, OYEWU & SÆTHER 1998, ZHANG & WANG 2004, LANGTON & PINDER 2007, SÆTHER & OYEWU 2008, SÆTHER & SPIES 2013, XIALONG et al. 2013, ZHANG et al. 2015, MOUBAYED-BREIL et al. 2019, MOUBAYED-BREIL 2020, MOUBAYED-BREIL & LANGTON 2020) have been provided and show that there are about 49 species of which only 3 are currently reported from France: *P. convictum* (Walker, 1856), *P. cultellatum* Goetghebuer, 1921 and *P. tissoti*. Consequently, the description of *P. bernardae* sp. nov. and *P. claudei* sp. nov. increases the total number of valid species to 5 for this country. Remarks with differential diagnosis and key to known male adults from Europe are given.



Photo 1. Type-locality of *P. bernardae* sp. nov. and *P. claudei* sp. nov. (Photo Jocelyn Claude).

Photo 1. Localité-type de *P. bernardae* sp. nov. et *P. claudei* sp. nov. (Cliché Jocelyn Claude).

2. Material and methods

The male adults were collected exclusively by Malaise traps placed close to peat bogs and wet sedge meadows located in eastern France. 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 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), NIITSUMA (1992) and SÆTHER & OYEWO (2008).

3. Results and descriptions

Polypedilum (Uresipedilum) bernardae Moubayed-Breil, sp. nov.

Material examined. France. Holotype: 1 male adult (leg. B. Tissot), Malaise traps placed close to peat bogs and wet sedge meadows of Vurpillières and Crossat (Photo 1), National Nature Reserve of Remoray Lake, eastern France (46.7717° N; 6.2632° E); altitude 800-850 m, 17.IV.2019.

Paratype (leg. B. Tissot). 1 male adult preserved in 80% ethanol, same data as for holotype.

Holotype (male adult, on one slide) is deposited in the collections of the Zoologische Staatssammlung of (SNSB-ZSM), Munich, Germany. The paratype is deposited in the collection of the author.

Etymology. The new species is named “*bernardae*” in honour to Anaëlle Bernard, who remains active as a co-curator of the Nature Reserve of Remoray Lake in contributing to preserving the environment delimited by this protected area.

Diagnosis

P. bernardae sp. nov. can be distinguished from other related species in having the following unusual characters in the male adult. Antenna unusually 11-segmented (occasionally 12). Clypeus sub-rectangular with 2 characteristic posteriorly directed antero-median bands. Palpomere 3 with 4 short pin-like sensilla coeloconica. Lobes of antepnotum slightly gaping. Apex of tibia and tarsomere ta₁ of PI triangular; pulvilli *Polypedilum*-type shaped. Segment VIII distinctly tapered basally; tergites II-VIII with a similar pattern of rectangular spots. Tergite IX without dorsal setae, anal tergite bands distinctly branched at base and parallel-sided in distal part. Anal point broadly ellipsoidal, ending with a characteristic papillate point apically, 41-43 setae present on dorsal, lateral and ventral sides. Superior volsella marsupial-pouch-like with spherical posterior lobe; dorsal and ventral sides covered with long and short setae; inner process sickle-like, bare with sclerotized outer margin. Inferior volsella gradually expanded distally; setiferous ventral lobe well-developed bearing 15-16 setae (5 are stout and inwardly curved, 10-11 shorter and placed along 2-3 arched rows). Gonocoxite with a characteristic short finger-like expansion located on outer apical margin. Gonostylus slender, slightly swelling outwards medially and parallel-sided distally; thin needle-like setae present on inner distal margin.

Description

Male adult (n = 2, Figs 1A-L, 2A-C); = *Polypedilum (Ur.)* sp. 2 in MOUBAYED-BREIL & LANGTON (2020); Big sized species. Total length 5.30-5.40 mm. Wing length 3.55-3.65 mm, TL/WL = 1.47-1.49.

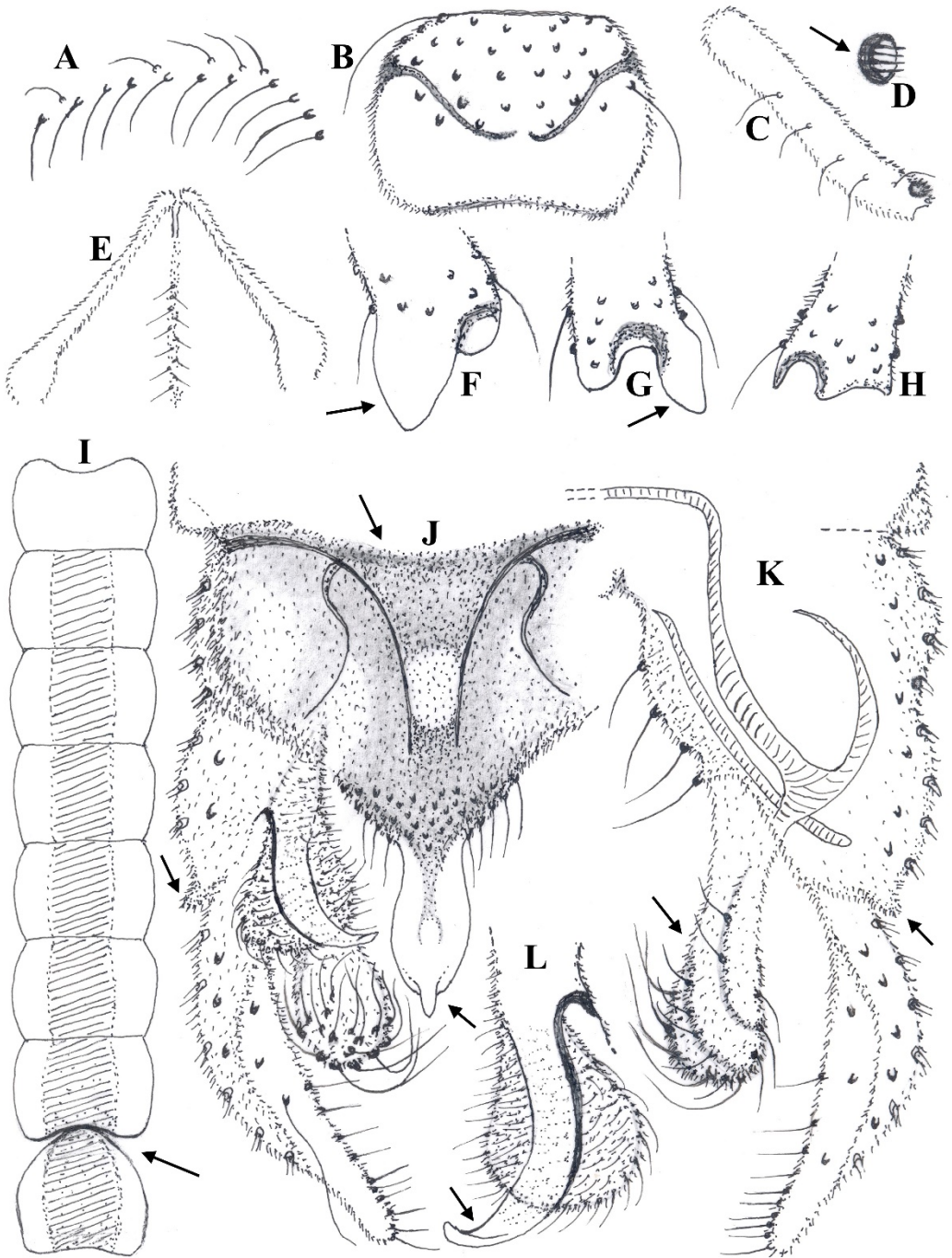


Figure 1 (p. 86). Male imago of *Polypedilum (Ur.) bernardae* sp. nov.: temporal setae, inner verticals (A); clypeus (B); palpomere 3 (C); sensilla coeloconica (D); lobes of antep pronotum with acrostichals (E); apex of tibia of PI (F); apex of tarsomere ta_1 of PI (G); apex of tarsomere ta_1 of PII-III (H); abdominal segments I-VIII with spots on tergites II-VIII (I); hypopygium, dorsal and ventral view (J-K); superior volsella, dorsal view (L). The arrows indicate some distinguishing characters.

Figure 1 (p. 86). Imago mâle de *Polypedilum (Ur.) bernardae* sp. nov. : soies temporales internes (A); clypéus (B); palpomère 3 (C); sensilla coeloconica (D); lobes de l'antep pronotum et soies acrostichales (E); apex tibial de PI (F); apex du tarsomère ta_1 de PI (G); apex du tarsomère ta_1 de PII-III (H); segments abdominaux I-VIII avec les taches sur les tergites II-VIII (I); hypopyge, vues dorsale et ventrale (J-K); volselle supérieure, vue dorsale (L). Les flèches indiquent quelques caractères discriminants.

General colouration brownish with dark brown to blackish legs and abdomen. Head dark brown with blackish eyes; palpomeres and antennae brownish. Thorax contrasting brown to dark brown, mesonotal stripes dark brown; humeral area yellowish; wing unmarked. Legs with blackish tarsomeres ta_1 - ta_3 of PI-PIII. Abdomen with contrasting rectangular blackish spots on tergites II-VIII. Anal segment contrasting brown to blackish.

Head. Eyes bare between ommatidia, hairs absent on inner lateral and outer posterior margin of eye. Coronals 4, vertex uniformly thin from base to apex, tubercles absent. Temporals 19-20 including 16-17 inner and 3 outer verticals; inner verticals (Fig. 1A) composed of 11 long and 5 short setae located in 2 rows. Clypeus (Fig. 1B) about 145 μ m long and 210 μ m maximum width, sub-rectangular, with 2 distinct posteriorly directed bands on antero-median part, 35-37 setae present in 4-5 rows. Palp 5-segmented, first and second segments fused; length (μ m) of palpomeres: 55, 70, 275, 205, 305 (palpomere 3 longer than 4); palpomeres 3 (Fig. 1C) with 5 sensilla clavata and 4 short needle-like sensilla coeloconica (Fig. 1D); additional sensilla clavata are present on segments: 4 (4) and 5 (5-6). Antenna 1810-1820 μ m long, 11-segmented (occasionally 12); ultimate flagellomere 1350-1360 μ m long, linearly elongated and slightly clubbed distally, pre-apical sensilla chaetica weakly-developed, pre-apical seta absent; antennal groove beginning on segments 3 and reaching ultimate flagellomere; AR about 3.0.

Thorax. Lobes of antep pronotum (Fig. 1E) not in contact, thinner medially, lateral antep pronotals apparently absent; acrostichals (Fig. 1E) 11 in one row; dorsocentrals 22-23 in 2 rows; prealars 6; humeral area without granulation, humeral pit absent; scutellum with 18 setae in one row. Wing unmarked; brachiolum with 3 setae; number of setae on veins: R, 43-45; R_1 , 25-27; R_{2+3} , indistinct; R_{4+5} , 60-65; remaining veins bare; squama with 29-31 setae in 1-2 rows.

Legs. Tibial spur on PII-PIII fused with combs; apex of tibia of PI triangular (Fig. 1F), apex of tarsomere ta_1 of PI thumb-like shaped (Fig. 1G); tibia and tarsomeres ta_1 - ta_5 of PI-PIII densely covered with sensilla chaetica; pseudospurs present on tarsomeres ta_1 - ta_3 of PI-PIII; pulvilli are *Polypedilum*-type shaped (not pad-like). Length (μ m) and proportions of prothoracic (PI), mesothoracic (PII) and metathoracic (PIII) legs as in the following table:

	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₅	LR	BV	SV	BR
PI	1450	1310	1755	925	765	650	305	1.34	1.71	1.57	1.75
PII	1580	1485	780	475	370	270	190	0.53	2.95	3.93	1.50
PIII	1710	1755	1125	670	550	325	205	0.64	2.62	3.08	1.70

LR = length of tarsomere ta_1 divided by length of tibia (ti); BV = combined length of femur (fe), tibia and ta_1 divided by combined length of tarsomeres ta_2 - ta_5 ; SV = ratio of femur plus tibia to tarsomere ta_1 ; BR = ratio of longest seta of ta_1 divided by minimum width of ta_1 , measured one third from apex.

Abdomen (Fig. 1I). Hypopygium in dorsal and ventral view as in Figs 1J-K, tergite IX and anal point are removed in ventral view as in Fig. 1K. Segment VIII distinctly tapered at base and distinctly fused to posterior midline of segment VII; tergites II-VIII with rectangular spots. Tergite IX about 300-320 μm long and 150-160 μm maximum width, broadly sub-rectangular in basal and median part, narrowing posteriorly; dorsal setae absent on median area between anal tergite bands; anal tergite bands widely open and distinctly branched basally, tapering medially and abruptly interrupted near the base of anal point, thicker basally and regularly thin with parallel-sided distally; median area between anal tergite bands whitish. Anal point (Fig. 1J, dorsal; Fig. 2A, lateral) about 125 μm long, wide at base 85 μm and 25-30 μm in median part; in dorsal view (Fig. 1J) is ellipsoidal and elongate, ending with a characteristic papillate point apically; proximal half with a characteristic crest clearly visible when the anal point is viewed laterally (Fig. 2A); 41-43 setae are present, including 25-27 on dorsal area, 10 laterally (5 on each side) and 6 on ventral side. Laterosternite VIII with 12-14 setae (6-7 on each side). Apodemes (Fig. 1K): sternapodeme orally projecting, transverse sternapodeme about 100 μm long, thinner than lateral coxapodeme; phallapodeme about 180 μm long, linearly elongated. Superior volsella in dorsal (Figs 1J, L) and lateral view (Fig. 2B), 110-115 μm long, wide at base about 50 μm and 75 μm in distal part; densely covered with long and short setae inserted on both dorsal and ventral sides; basal part rectangular as in Figs 3B-C; posterior lobe marsupial-pouch-like to spherical (Figs 2M, 3C), in lateral view it is ovoid to ellipse-like; inner process 125 μm long, about 25 μm maximum width, sickle-like shaped, bare, outer lateral margin with characteristic sclerotization. Inferior volsella (Figs 1J-K, dorsal; 2C, lateral) 225 μm long, 55 μm maximum width in its distal part, gradually expanded distally; setiferous ventral lobe well-developed, composed of 15-16 setae including 5 stout inwardly curved setae and 10-11 shorter placed along 2-3 arched rows. Gonocoxite 250 μm long, 175 μm maximum width at base, bearing 14-16 dorsolateral setae (7-8 on each side); basal inner margin (Fig. 1K) with 4 stout ventral setae; outer apical margin terminates with a characteristic short finger-like expansion. Gonostylus (Figs 1J, dorsal; 1K, ventral; 2C, lateral) 275 μm long, about 65-70 μm maximum width in its median part, slender, slightly swelling outwards medially and parallel-sided distally, inner distal margin with thin and needle-like setae.

Pupa and larva: unknown.

Polypedilum (Uresipedilum) claudei Moubayed-Breil, sp. nov.

Material examined. France. Holotype: 1 male adult (leg. B. Tissot), Malaise traps placed close to peat bogs and wet sedge meadows of Vurpillières and Crossat (Photo 1), National Nature Reserve of Remoray Lake, eastern France (46.7717° N; 6.2632° E); altitude 800-850 m, 17.IV.2019.

Paratypes (leg. B. Tissot). 3 male adults, same data as for holotype.

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

Etymology. The new species is named "*claudei*" in honour to Jocelyn Claude, who remains active as a co-curator of the Nature Reserve of Remoray Lake in contributing to preserving the environment of the protected area.

Diagnosis

P. tissoti represents the closest species to *P. claudei* sp. nov., based on some common characters found in the male adult: tergite IX with dorsal setae on median area, anal point wide and drop-

like, gonostylus markedly broad medially and abruptly tapering distally. However, *P. claudei* sp. nov. is easily separated from other members of the subgenus *Uresipedilum* in having a combination of differentiating characters. Clypeus sub-rectangular, with 2 characteristic orally directed bands located postero-medially. Palpomere 3 with 3 long pin-like sensilla coeloconica. Lobes of anteprenotum not in contact, weakly gaping. Apex of tibia and tarsomere ta_1 of PI wide nose-like shaped; pulvilli *Polypedilum*-type shaped. Abdomen. Segment VIII distinctly tapered basally. Tergites I-VIII distinctly spotted. Tergite IX nearly semi-circular, with 12-14 dorsal setae on median area; anal tergite bands relatively short, distinctly branched at base and abruptly interrupted distally. Anal point broadly ellipsoidal bearing a characteristic crest; 41-44 setae are located on dorso-lateral and ventral sides. Laterosternite VIII with 12-14 setae (6-7 on each side). Posterior lobe of superior volsella marsupial-pouch-like, distinctly spherical distally; inner process linearly elongate with curved apex, sclerotized band along the midline is only visible in lateral view. Inferior volsella linearly elongate, apical part spherical; setiferous ventral lobe well-developed bearing 18-19 setae including 6 long and stout (inwardly curved) and 12-13 shorter, placed along 3 arched rows). Gonocoxite with a characteristic long finger-like apical expansion located on outer margin. Gonostylus extremely bulbous medially and abruptly tapering distally, distal part nearly parallel-sided; thin setae with crotchet-like apex present on inner distal margin.

Description

Male adult (n = 4; Figs 2D-I, L-O; 3A-E). Big sized species. Total length 6.50-7.50 mm. Wing length 3.80-3.90 mm, TL/WL = 1.71-1.92.

General colouration: greenish brown, dark brown, dark brown and blackish. Head, brown to dark brown. Thorax green brownish to dark brown with blackish mesonotal stripes and scutellum, humeral area yellow brownish. Wing unmarked. Legs green brownish proximally with blackish tarsomeres ta_3 - ta_5 . Abdomen with contrasting rectangular blackish spots on tergites I-VIII (spots on tergites: II-III ovoid, IV-VI/VII cup-like shaped. Anal segment contrasting brownish to blackish, median area between anal tergite bands distinctly whitish.

Head. Eyes bare between ommatidia, hairs absent on inner lateral and outer posterior margin of eye. Coronals 4, vertex uniformly thick from base to apex, bearing a characteristic sub-triangular tubercle medially. Temporals 18-19 including 15-16 inner and 3 outer verticals; inner verticals (Fig. 2D) composed of 10-11 long and 5 short setae located in 2 rows. Clypeus (Fig. 2E) about 155 μ m long and 225 μ m maximum width, sub-rectangular, with 2 characteristic orally directed sclerotized bands located postero-medially, 30-34 setae present in 4 rows. Palp 5-segmented, first and second segments fused; length (μ m) of palpomeres: 55, 65, 225, 230, 365 (palpomeres 3 and 4 subequal); palpomeres 3 (Fig. 2F) with 4 sensilla clavata and 3 long needle-like sensilla coeloconica; additional sensilla clavata present on segments: 4 (1) and 5 (3). Antenna 1760-1780 μ m long, 11-segmented (occasionally 12); ultimate flagellomere about 1305 μ m long, linearly elongated and weakly-clubbed apically, pre-apical sensilla chaetica well-developed, pre-apical seta absent; antennal groove beginning on segments 3 and reaching ultimate flagellomere; AR 3.0-3.10.

Thorax. Lobes of anteprenotum (Fig. 2G) not in contact and widely open, nearly as thick in both basal and median parts, lateral anteprenotals apparently absent; acrostichals (Fig. 2G) 13-14 in one row located short distance from anteprenotum; dorsocentrals 24-25 in 1-2 rows; prealars 6 in one row; granulation and humeral pit apparently absent; scutellum with 24-26 setae in 2 rows. Wing: Brachiolum with 3 setae; number of setae on veins: R, 35-37; R_1 , 23-28; R_{2+3} and R_{4+5} bare; remaining veins bare; squama with 33-38 setae in 1-3 rows.

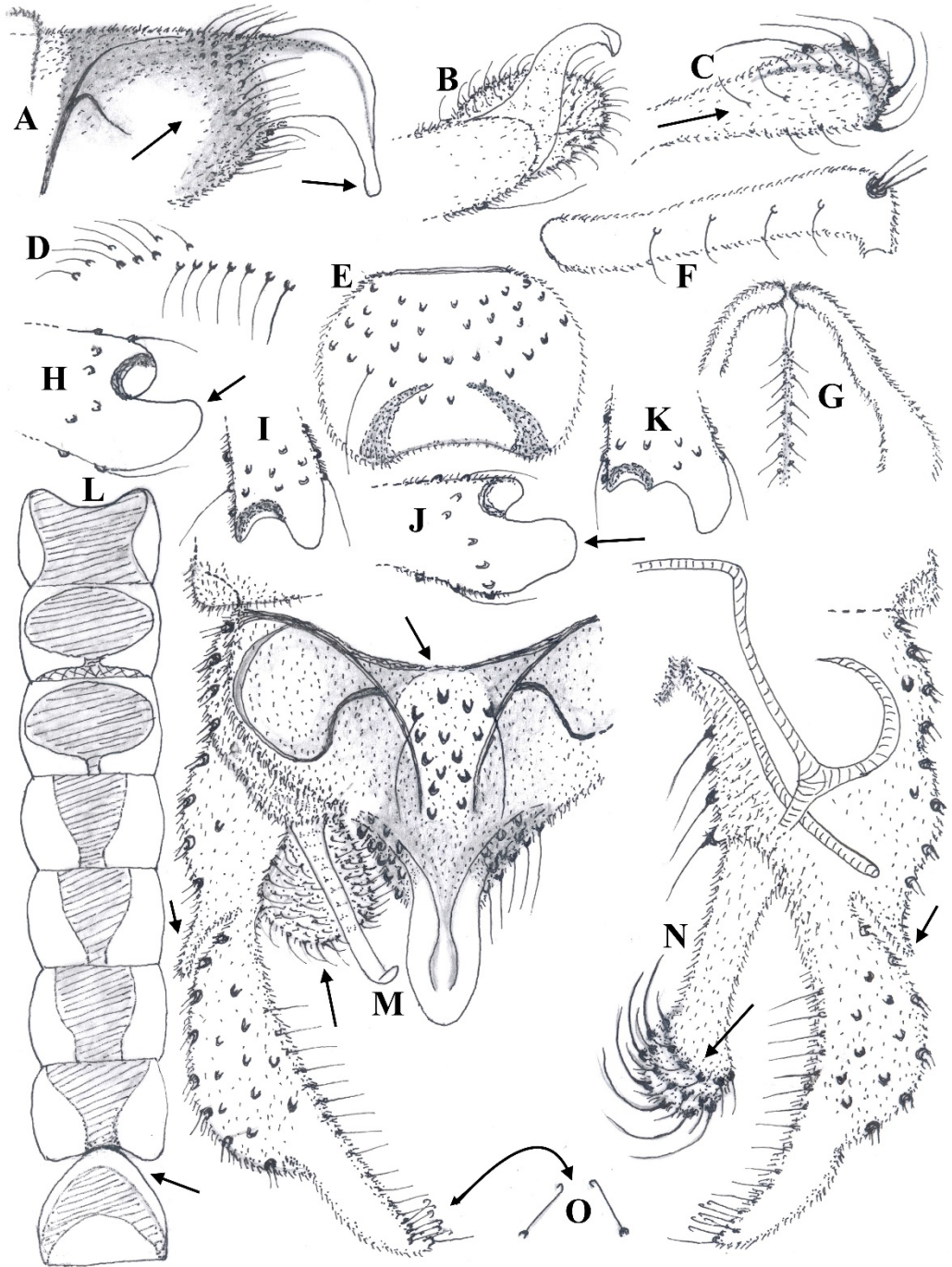


Figure 2 (p. 90). Male imago of *Polypedilum (Ur.)* spp. *P. bernardae* sp. nov.: tergite IX and anal point, lateral view (A); superior volsella, lateral view (B); inferior volsella with setiferous ventral lobe, lateral view (C). *P. claudei* sp. nov.: temporal setae, distribution pattern of inner verticals (D); clypeus (E); palpomere 3 (F); lobes of antepnotum with acrostichals (G); apex of tibia of PI (H); apex of tarsomere ta₁ of PI (I). *P. tissoti*: apex of tibia of PI (J); apex of tarsomere ta₁ of PI (K). *P. claudei* sp. nov.: abdominal segments I-VIII with spots on tergites I-VIII (L); hypopygium, dorsal and ventral view (M-N); apical inner setae of gonostylus (O). The arrows indicate some distinguishing characters.

Figure 2 (p. 90). Imago mâle de *Polypedilum (Ur.)* spp. *P. bernardae* sp. nov.: tergite IX et pointe anale, vue latérale (A); volselle supérieure, vue latérale (B); volselle inférieure et lobe sétifère ventral, vue latérale (C). *P. claudei* sp. nov.: soies temporales internes (D); clypéus (E); palpomère 3 (F); lobes de l'antepnotum et soies acrostichales (G); apex tibial de PI (H); apex du tarsomère ta₁ de PI (I). *P. tissoti*: apex tibial de PI (J); apex du tarsomère ta₁ de PI (K). *P. claudei* sp. nov.: segments abdominaux I-VIII avec les taches sur les tergites I-VIII (L); hypopyge, vues dorsale et ventrale (M-N); soies internes du gonostyle (O). Les flèches indiquent quelques caractères discriminants.

Legs. Tibial spur on PII-PIII fused with combs; apex of tibia of PI (Fig. 2H) nose-like shaped as for tarsomere ta₁ of PI (Fig. 2I); tibia and tarsomeres ta₁-ta₅ of PI-PIII densely covered with sensilla chaetica; pseudospurs present on tarsomeres ta₁-ta₃ of PI-PIII; pulvilli are *Polypedilum*-type shaped. Length (µm) and proportions of prothoracic (PI), mesothoracic (PII) and metathoracic (PIII) legs as in the following table:

	fe	ti	ta ₁	ta ₂	ta ₃	ta ₄	ta ₅	LR	BV	SV	BR
PI	1340	1075	1835	910	770	685	310	1.71	1.59	1.32	2.00
PII	1450	1305	815	435	320	210	145	0.63	3.22	3.38	2.20
PIII	1560	1525	1130	625	460	275	160	0.74	2.77	2.73	2.00

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.

Abdomen as in Fig 2L. Hypopygium in dorsal and ventral view as in Figs 2M-N (tergite IX and anal point are removed in ventral view as in Fig. 2N). Segment VIII markedly tapered at base and fused to posterior midline of segment VII. Tergites II-VIII with a specific pattern of differently figured spots (those on tergites II-III oval, on IV-VI/VII similarly cup-like shaped). Tergite IX about 210-225 µm long and 255-265 µm maximum width, antero-median part broadly semi-circular, distinctly narrowing posteriorly; with 12-14 dorsal setae on median area between anal tergite bands; anal tergite bands widely open, anteromedian part distinctly branched, tapering posteriorly, abruptly interrupted near the base of anal point, thicker basally and regularly thin distally, apical part short and parallel-sided. Anal point (Fig. 2M, dorsal; Fig. 3A, lateral) about 120 µm long, maximum width about 90 µm at base and 20-25 in median part; sub-oval to sub-rectangular and nearly parallel-sided; dorsal side with a characteristic crest reaching distal part, clearly visible in lateral view (Fig. 3A); 41-44 setae are present, including 25-27 dorsally, 10 laterally (5 on each side) and 6-7 ventrally. Laterosternite VIII with 10-12 setae (5-6 on each side). Apodemes (Fig. 2N), sternapodeme orally projecting, transverse sternapodeme about 100 µm long, lateral sternapodeme 150-160 µm long, phallapodeme about 180 µm long, linearly elongated. Superior volsella in dorsal (Fig. 2M), lateral (Fig. 3D) and ventral view (Fig. 3B-C) about 100 µm long and 50 µm maximum width; posterior lobe marsupial-pouch-like, distal half distinctly spherical, both dorsal and ventral sides densely covered with long and short setae; inner process 125 µm long, about 25 µm maximum width, linearly elongate with curved apex and entirely bare, sclerotized band along the midline is only visible in lateral view (Fig. 3D). Inferior volsella (Figs 2N, dorsal;

3E, lateral) 100-110 μm long, markedly spherical in its apical part; setiferous ventral lobe well-developed, composed of 18-19 setae (6 stout, inwardly curved; 12-13 shorter, placed along 3 arched rows). Gonocoxite about 200 μm long, terminates with a characteristic long finger-like apical expansion. Gonostylus distinctly swollen medially and abruptly narrowing distally; distal part parallel-sided, outer margin bare (long setae absent); characteristic needle-like setae with crotchet-like apex present on inner distal margin.

Pupa and larva: unknown.

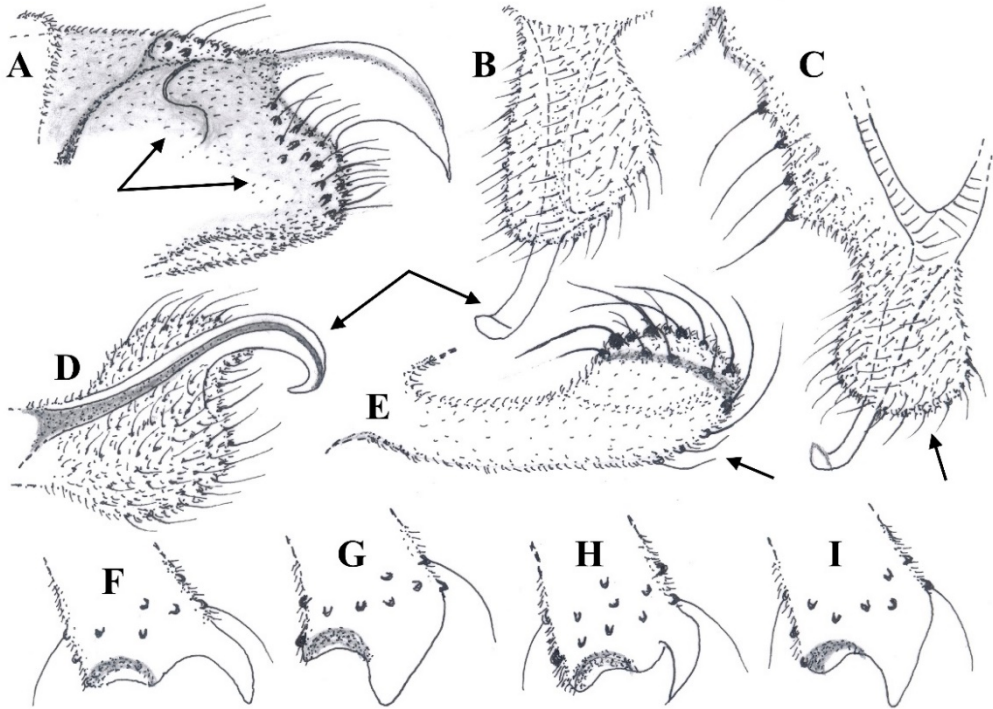


Figure 3. Male imago of *Polypedilum* (*Ur.*) spp. *P. claudei* sp. nov.: tergite IX and anal point, lateral view (A); superior volsella, ventral view (B); basal part of gonocoxite with superior volsella, ventral view (C); superior volsella, lateral view (D); inferior volsella with setiferous ventral lobe, lateral view (E). *P. cultellatum*: apex of tibia and tarsomere ta_1 of PI (F-G); *P. convictum*: apex of tibia and tarsomere ta_1 of PI (H-I).

The arrows indicate some distinguishing characters.

Figure 3. Imago mâle de *Polypedilum* (*Ur.*) spp. *P. claudei* sp. nov.: tergite IX et pointe anale, vue latérale (A); volselle supérieure, vue ventrale (B); partie basale du gonocoxite et volselle supérieure, vue ventrale (C); volselle supérieure, vue latérale (D); volselle inférieure et lobe sétifère ventral, vue latérale (E). *P. cultellatum*: apex tibial et tarsomère ta_1 de PI (F-G); *P. convictum*: apex tibial et tarsomère ta_1 de PI (H-I). Les flèches indiquent quelques caractères discriminants.

4. Differential diagnosis

P. bernardae sp. nov. and *P. claudei* sp. nov. can be separated from other known European members of the subgenus *Uresipedilum* by a combination of differentiating characters:

- Sensilla coeloconica of palpomere 3 composed of 4 short pin-like in *P. bernardae* sp. nov. (Figs 1C-D), consists of 3 long needle-like in *P. claudei* sp. nov. (Fig. F) and only 1 single long pin-like in *P. tissoti* (MOUBAYED-BREIL & LANGTON 2020; Fig. 1B);
- Apex of tibia of PI broad triangle-like in *P. bernardae* sp. nov. (Fig. 1F) is nose-like shaped in *P. claudei* sp. nov. (Fig. 2H) and claw-like in both *P. convictum* (Fig. 3H) and *P. cultellatum* (Fig. 3F);
- Leg ratio (LR) of PI is 1.34 in *P. bernardae* sp. nov. (Table 1), while it is 1.71 in *P. claudei* sp. nov. (Table 2), 1.63 in *P. tissoti*, 1.65 and 1.65-1.75 in *P. convictum* and *P. cultellatum*;
- Tergites distinctly spotted in *P. bernardae* sp. nov. and *P. claudei* sp. nov. (Figs 1I, 2I), are unspotted in both *P. cultellatum* and *P. convictum*;
- Anal point ending with a characteristic papillate point apically (Figs 1J, 2A), is differently figured in *P. claudei* sp. nov. (Fig. 2M, 3A) and *P. tissoti* (MOUBAYED-BREIL & LANGTON 2020, Figs 1N, 2A);
- Base of superior volsella mostly bulbous to spherical in both *P. bernardae* sp. nov. and *P. claudei* sp. nov. (Figs 1J, L; 2M; 3C), is absent in *P. tissoti* (MOUBAYED-BREIL & LANGTON 2020, Figs 1N, P) and differently figured in *P. convictum* and *P. cultellatum* (LEHMANN 1971, Fig. 38; ALBU 1980, Fig. 143; ROSSARO 1984, Figs 10H, 11H; LANGTON & PINDER 2007, Figs 97A, 229A; Niitsuma 1992, Figs 3, 5-6; SÆTHER & OYEWO 2008, Figs 7A-B);
- Outer margin of gonocoxite with a characteristic short lobe-like apical expansion in *P. bernardae* sp. nov. (Figs J-K), is bearing a long finger-like expansion in *P. claudei* sp. nov. (Figs 2M-N), while it is absent in *P. tissoti* (MOUBAYED-BREIL & LANGTON 2020, Figs 1N, 2A);
- Gonostylus is mostly slender in *P. bernardae* sp. nov. (Figs 1J-K), while is strongly broad medially and abruptly tapering distally in both *P. claudei* sp. nov. (Figs 2M-N) and *P. tissoti* (MOUBAYED-BREIL & LANGTON 2020, Figs 1N-O);
- Setiferous ventral lobe of inferior volsella is differently figured in *P. bernardae* sp. nov. (Figs 1K, 2C), *P. claudei* sp. nov. (Figs 2N, 3E) and *P. tissoti* (MOUBAYED-BREIL & LANGTON 2020, Figs 1N, 2A); moreover, the long apical seta of inferior volsella is absent in the 3 latter species, while it is present in *P. convictum* and *P. cultellatum* (LEHMANN 1971, Fig. 38; ALBU 1980, Fig. 143; LANGTON & PINDER 2007, Figs 97A, 229A; NIITSUMA 1992, Figs 3, 5-6; SÆTHER & OYEWO 2008, Figs 7A-B).

Moreover, *P. bernardae* sp. nov. and *P. claudei* sp. nov. can be distinguished from their European congeners on the basis of some relevant morphological features, which are summarized in the following key.

Key to male adults of known *Polypedilum* (*Uresipedilum*) species from Europe

1. Anal point broadly ellipsoidal, diamond-like to rectangular, gonostylus extremely broadened medially, abruptly narrowed and tapering distally **2**
 - Anal point slender and parallel-sided, gonostylus mostly slender, not abruptly tapering distally **3**
2. Superior volsella marsupial-pouch-like shaped, mostly bulbous to spherical; inner process long sickle-like (Figs 1J, L) *P. bernardae* sp. nov.
 - Superior volsella evenly wide from base to apex, sausage-like shaped; inner process linear and short (MOUBAYED-BREIL & LANGTON 2020, Figs 1N, P) *P. tissoti*

3. Tergites I-VIII distinctly spotted (Fig. 11) *P. claudei* sp. nov.
 - Tergites I-VIII unspotted 4
4. Base of superior volsella with one single long apical seta *P. convictum*
 - Base of superior volsella with several subequal apical setae *P. cultellatum*

5. Ecology and distribution

Type material of *P. bernardae* sp. nov. and *P. claudei* sp. nov. was collected in some peat bogs and wet sedge meadows of ‘Vurpillières and Crossat’ at the Nature Reserve of Remoray Lake, E-France (Photo 1).

Emergence: from April to June-July.

Associated species encountered in the same localities include: *Macropelopia notata* (Meigen, 1818); *Procladius choreus* (Meigen, 1804); *P. sagittalis* (Kieffer, 1909); *P. signatus* (Zetterstedt, 1850); *Prodiamesa olivacea* (Meigen, 1818); *Acricotopus lucens* (Zetterstedt, 1850); *Bryophaenocladus flexidens* (Brundin, 1947); *B. scanicus* (Brundin, 1947); *B. tuberculatus* (Edwards, 1929); *Chaetocladius dentiforceps* (Edwards, 1929); *Cricotopus algarum* (Kieffer, 1911); *C. curtus* Hirvenoja, 1973; *Diplocladius cultriger* Kieffer, 1908; *Gymnometriocnemus brumalis* (Edwards, 1929); *Hydrobaenus lugubris* (Fries, 1830); *Limnophyes gelasinus* Sæther, 1990; *Psectrocladius barbimanus* (Edwards, 1929); *P. obvius* (Walker, 1856); *P. platypus* (Edwards, 1929); *Paraphaenocladus penerasus* Edwards, 1929; *Smittia remoraya* Moubayed & Tissot, 2019; *S. superata* (Goetghebuer, 1939); *C. luridus* Strenzke, 1959; *C. nuditarsis* Keyl, 1961; *C. dorsalis* (Meigen, 1818); *Microtendipes nitidus* (Meigen, 1818); *M. tarsalis* (Walker, 1856); *Polypedilum nubeculosum* (Meigen, 1804); *P. nubifer* (Skuse, 1889); *P. tissoti*; *P. cultellatum*; *Micropsectra lindrothi* Goetghebuer, 1931; *Paratanytarsus dissimilis* (Edwards, 1929); *Tanytarsus debilis* (Meigen, 1830); *T. innarensis* Brundin, 1947; *T. usmaensis* Pagast, 1931.

The two new species are known only from their type-locality.

Acknowledgements.

The author is grateful to Dr. Hiromi Niitsuma (Shizuoka University, Japan) for his constructive suggestions, which improved the manuscript. We are also indebted to the staff responsible including assistant-curators for the Nature Reserve of Remoray Lake for collecting the type material of the two new species. *P. bernardae* sp. nov. and *P. claudei* sp. nov. are described based on the project-2020 (Code SE.4) financed by the DREAL Bourgogne-Franche-Comté.

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