

Description of *Parakiefferiella normandiana* sp. n. from France [Diptera: Chironomidae]

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A description of the male imago and pupal exuviae of *Parakiefferiella normandiana* sp. n. is given with comments on its systematics, ecology and geographical distribution.

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Mots-clés : Diptera, Chironomidae, espèce nouvelle, *Parakiefferiella*, imago mâle, exuvie nymphale, France.

Les auteurs donnent une description de l'imago mâle et de l'exuvie nymphale de *Parakiefferiella normandiana* sp. n., ainsi qu'un commentaire sur sa systématique, son écologie et sa distribution géographique.

Introduction

Only short descriptions of the pupal exuviae of *Parakiefferiella* sp. 1 are hitherto given in the literature. The first one is by REISS (1968) on the basis of 1 male and 1 female pupal exuviae from lake Bodensee, Germany. The second, as *Parakiefferiella* Pe 1, is by LANGTON (1984) who reported two decades later pupal exuviae of the same species from England. Recent extensive investigations in lowland permanent and temporary streams in Continental France produced one pharate adult male and a few pupal exuviae of *Parakiefferiella* sp. 1 from streams located in both Southern and North-East France (MOUBAYED-BREIL 2008).

In this paper we give a description of the male imago and pupal exuviae of *Parakiefferiella normandiana* sp. n. (= *Parakiefferiella* sp. 1) on the basis of the pharate adult male and pupal exuviae collected in Continental France, Great Britain and Spain. Terminology follows that of SÆTHER (1980), LANGTON & PINDER (2007) for male imago, and that of SÆTHER (1980) and LANGTON (1991) for pupal exuviae. The larva of *Parakiefferiella* sp. 1 has been described by DURAN et al (1995) as *Epoicocladus* sp. a, phoretic on the nymphs of *Ephemera danica* Müller, 1784.

Description of *Parakiefferiella normandiana* sp. n.

Material

Holotype: 1 pharate adult male, Arn stream, a tributary of the river Tarn, Haut-Languedoc, Southern France, subregion 9a, 08.27.2002.

Paratypes: 2 female pupal exuviae, Guiel stream, North-West France, sub-region 1a, 06.06.2007; 1 pupal exuviae, River Arrow, Warwickshire, England, 27.08.1981; 1 pupal exuviae chalk stream, Cranham Woods, Gloucestershire, England, 25.08.1986; 1 pupal exuviae, Loch Assynt, Sutherland, Scotland, 29.07.1979; 1 pupal exuviae, Rio Grande, Vacar, S. Spain, 05.10.1991 (leg. J.J. Casas, coll. P.H. Langton).

Type material is deposited in the Natural History Collections, Bergen Museum, Norway (ZMBN); paratypes in the collections of the authors. The material was preserved in 70% alcohol and later mounted on slides in polyvinyl lactophenol solution.

Male imago

(n = 1, pharate adult male)

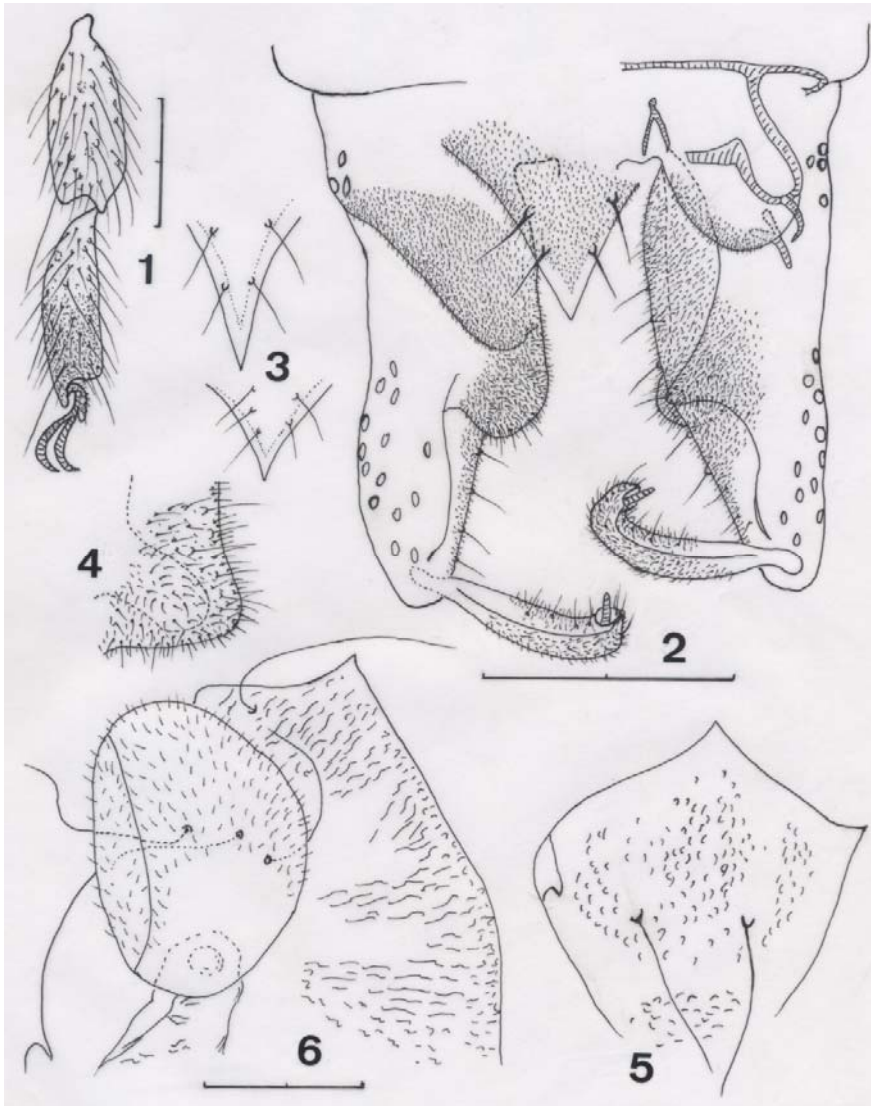
Larger than most members of the genus except *Parakiefferiella nigra* Brundin, 1949; total length 3.05 mm. Colour blackish brown; thorax and abdomen dark brown, mesonotal bands brownish; legs pale except tarsus 5 of P1, P2 and P3 which are darkened as in Fig. 1.

Head. Antenna 13-segmented; ultimate flagellomere 332 μ m long, club-shaped, with weakly curved sensillar setae subapically, AR 1.20. Eyes bare: outer and inner verticals absent, 2-3 postorbitals 77 μ m long. Palp segments 41, 43, 47, 61, 82 μ m long; sensilla clavata absent. Clypeus with 6-7 setae 98 μ m long.

Thorax with 4 anteprenotals, 7 acrostichals, 6-7 dorsocentrals, 3-4 prealars and 7 scutellars in one row. Wing 1.31 mm long, VR = 1.20; membrane densely covered with very fine granulation, difficult to see at magnifications less than X 400; SCf 2; SpA well represented; veins and squama bare; Cu2 clearly curved. Legs: spur of front tibia 47 μ m long, spurs of middle tibia 27 and 21 μ m long, spurs of hind tibia 48 μ m long, hind tibial comb with 12 setae, pseudospurs absent; ta4 of P2 wide, bilobed at apex and slightly shorter than ta5, ta5 darkened subapically, ta4 and ta5 of P2 as in Fig. 1. Length (μ m) and proportions of legs:

	fe	ti	ta1	ta2	ta3	ta4	ta5	LR	BV	SV	BR
PI	384	563	302	209	154	99	83	0.54	2.3	3.1	2.7
PII	481	467	253	121	098	68	76	0.54	2.7	3.7	1.8
PIII	446	473	258	157	121	85	87	0.55	2.6	3.6	2.6

Hypopygium in dorsal and ventral view as in Fig. 2. Anal tergite triangular, bearing 2 stout setae on each side laterally. Anal point triangular, without keel, very broad at base, pointed apically, about 36 μ m long, maximum width 27 μ m at base, gradually narrowed to apex, not as tapered as in *Parakiefferiella bathophila* (Kieffer, 1912) (Fig. 3). Tergite IX triangular, covered with very fine setae; laterosternite IX with 3-4 long setae. Gonocoxite 182 μ m long with well developed inferior volsella; dorsal lobe rectangular, 45 μ m wide, basal margin swollen; ventral lobe 29 μ m wide, nose shaped, not finger-like as in *bathophila* (Fig. 4: dorsal lobe, continued line; ventral lobe, dotted line). Gonostyle 87 μ m long, of normal *Parakiefferiella* type, curved distally, without crista dorsalis, bearing a pre-apical tooth, apical tooth 14 μ m long. HR = 2.1; HV = 3.1.



Figures 1-4. Male imaginal structures of *Parakiefferiella* spp. *P. normandiana* sp. n.: ta4 and ta5 of middle leg (1); hypopygium (2), dorsal (left) and ventral (right). *P. bathophila* Kieffer, two aspects of anal point (3); inferior volsella (4), dorsal (continued line) and ventral (dotted line). Scale in μm .

Figures 5-6. Male pupal exuviae of *P. normandiana* sp. n.: frontal apotome (5); thoracic horn, precorneal setae and anterior thorax (6). Scale in μm .

Figures 1-4. Structures imaginaires mâles de *Parakiefferiella* spp. *P. normandiana* sp. n.: ta4 et ta5 de la patte P2 (1); hypopyge (2), vues dorsale (à gauche) et ventrale (à droite). *P. bathophila* Kieffer, deux aspects de la pointe anale (3); volsella inférieure (4), vues dorsale (trait continu) et ventrale (pointillés).

Échelle en μm .

Figures 5-6. Exuvie nymphale du mâle de *P. normandiana* sp. n : apotome frontal (5) ; corne thoracique, soies précornéales et partie antérieure du thorax (6). Échelle en μm .

Pupal exuviae

(n = 5)

Total length 3.15 - 3.55 mm, thorax 0.90-0.11 mm long, abdomen 2.40-2.55 mm long. Generally transparent, thoracic horn brownish, thorax brownish along the suture, abdomen colourless to faintly darkened with a characteristic transverse median black band on the anterior part of tergites II to VIII.

Cephalothorax. Frontal apotome as in Fig. 5, thoracic horn and anterior thorax as in Fig. 6. Frontal apotome and anterior part of suture rugosely granulate. Cephalic tubercles very shallow, frontal setae 143-148 μm long. Thoracic horn 175-180 μm long and 130-140 μm wide, large and globular, almost as long as broad, nearly covered with setulae, in some specimens setulae are knobbed at the tip; precorneal setae 155, 143 and 98 μm long. Lateral and median anteprenotal setae about 176 μm , lateral anteprenotal as thick as median anteprenotal setae, both about 3 μm thick at base. Four dorsocentral setae, none spine-like; length in μm of dorsocentrals 1-4 respectively 110-115, 75-80, 86-91, 68-71.

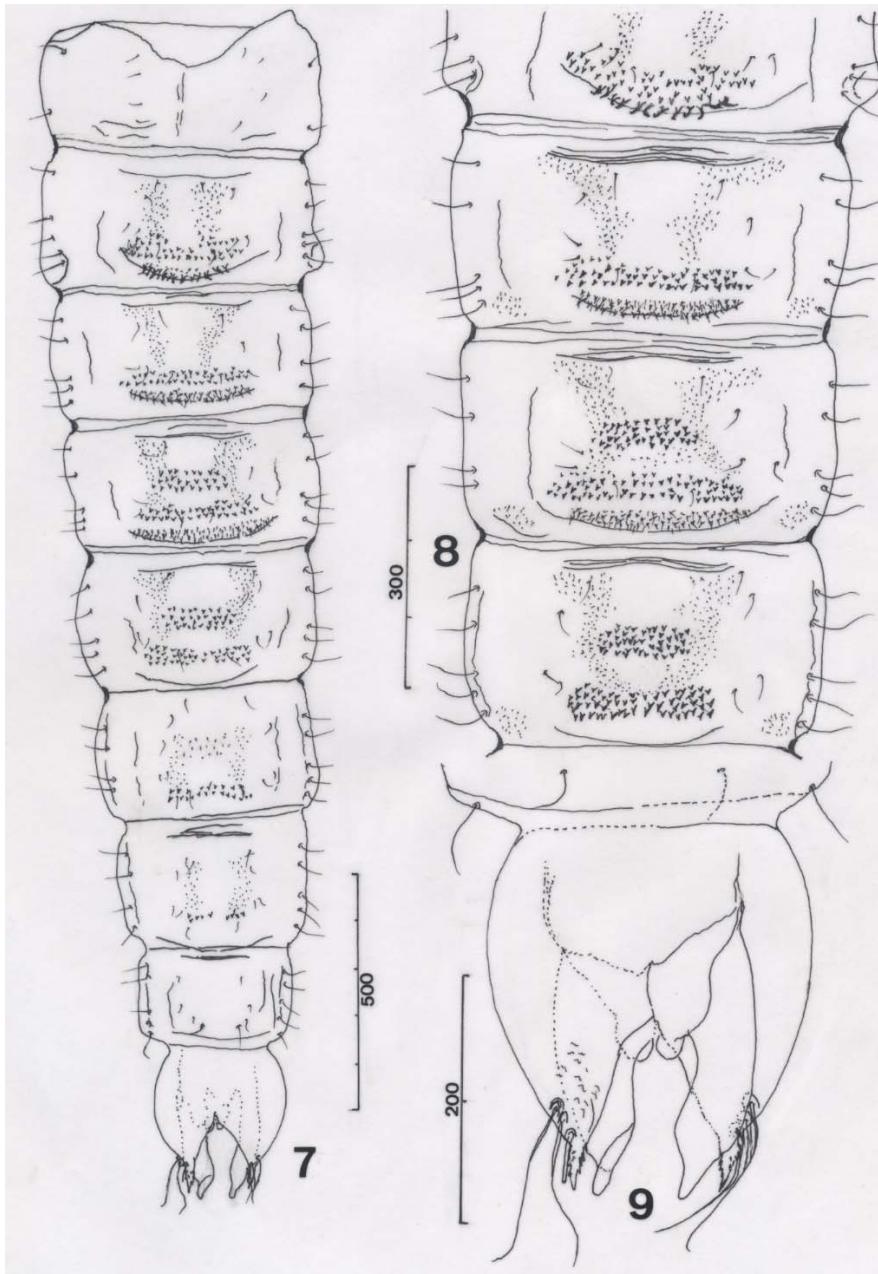
Abdomen as in Fig. 7 to 9. Tergite I unarmed. Tergites II-VII with a posterior transverse band of points; size of points is strongest on tergites II to VI, 3-4 rows of points on tergites III to V, 2-3 rows of points on tergites VI and VII. Tergites IV and V have an additional median patch of strong points. On tergites II-VII also small points form a lateral longitudinal band on each side from or in front of seta D1 to the posterior transverse band. Tergites VIII and IX unarmed. Distribution pattern of lateral setae and chaetotaxy of abdominal segments as in Fig. 5-6. Segment I with 2 lateral setae; segments II-VIII with 5 lateral setae, 4 lateral setae occasionally only on one side. Anal segment as in Fig. 9. Length of anal lobe: 0.28 mm (male), 0.32-0.40 mm (female). Anal lobe of normal *Parakiefferiella* type, each elongation with few to several teeth on outer and inner margins, elongations 40-55 μm long, longer than broad. Anal macrosetae 148-155 μm long, extending considerably beyond tips of anal lobe elongations. Pedes spurii A present on segments IV-VI; well developed pedes spurii B present on segment II.

Larva

Described by DURAN et al. (1995) as *Epoicocladius* sp. a, recorded as *Parakiefferiella* Pe 1 in the chironomid list for the Iberian Peninsula and Balearic Isles (SORIANO et al. 1997).

Taxonomic remarks

According to published works on morphological features of adults and pupal exuviae of the genus *Parakiefferiella* (BRUNDIN 1947, 1956; WÜLKER 1957; SÆTHER 1983; TUISKUNEN 1986, CASPERS & REISS 1989; LANGTON 1991, 1994; LANGTON & WISSER 2003; MOUBAYED 1991, 1994) the adult of *P. normandiana* is close to *P. bathophila* on the basis of the following combination of characters: high antennal ratio $AR = 1.20$ ($AR > 1$), well developed inferior volsella (morphology of both dorsal and ventral lobe), and shape of anal point. The pupal exuviae corresponds with the description of *Parakiefferiella* sp. 1 (REISS 1968) (*Parakiefferiella* Pe 1 in LANGTON (1984, 1991) and LANGTON & WISSER (loc.cit.)). The larva described by DURAN et al. (loc. cit.) bears close resemblance to that described as *Epoicocladius* sp. #3 by JACOBSEN (1992) and differs in a number of respects from the larva of *Parakiefferiella* as described by CRANSTON (1982), CRANSTON et al. (1983) and SCHMID (1993): 4 segmented antennae (5/6 in *Parakiefferiella*), mentum with 4 median teeth (1/2), epipharyngeal comb with 7 teeth (3 scales), seta S2 elongate, widened apically where pectinate (simple).



Figures 7-9. Male pupal exuviae of *Parakiefferiella normandiana* sp. n.: abdominal segments (7); detail of segments II-V (8); anal segment (9), dorsal (left) and ventral (right). Scale in μm .

Figures 7-9. Exuvie nymphale mâle de *Parakiefferiella normandiana* sp. n. : segments abdominaux (7) ; détail des segments II-V (8) ; segment anal (9), vues dorsale (à gauche) et ventrale (à droite). Échelle en μm .

However, if the wide range of variation in the described *Epoicocladius* larvae (JACOBSEN loc. cit.) is reflected in the genus *Parakiefferiella* the present description for which is based on a very few reared species, "*Epoicocladius* sp. a" could be the larva of a *Parakiefferiella*. Further evidence for generic placement must therefore be sought in the pupal and adult stages. The pupal exuviae of *Epoicocladius* sp. #3 (leg. R. Jacobsen, coll. P.H. Langton) closely resembles that of *P. normandiana* as described here, but has only 4 lateral setae to the abdominal segments, not 5. However, the hypopygium of adult *Epoicocladius* sp. #3 has straight gonostyles, a character given as "the best means of separation of *Epoicocladius* from *Parakiefferiella*..." (CRANSTON et al. loc.cit.). We therefore ascribe this new species to the genus *Parakiefferiella*.

There remains the possibility that *P. normandiana* and *Epoicocladius* sp.#3 are geographical variants of the same species and that the shape of the gonostylus is not a good generic discriminator here; *Parakiefferiella* may be a junior synonym of a highly variable genus *Epoicocladius*, some species of which are phoretic. When more associated larvae of *Parakiefferiella* species are available, cladistic analysis should be undertaken to resolve this inferred synonymy. If correctly placed, *P. normandiana* is the first *Parakiefferiella* shown to exhibit phoretic behaviour.

Ecology and distribution

Extensive investigations of lowland permanent and temporary springs and streams in Continental France have allowed us to associate a few pupal exuviae with a single pharate adult male belonging to *P. normandiana*. This new species is recorded only from two regions of the ten biogeographical regions and subregions of Continental France that have been delimited by MOUBAYED-BREIL (2008 in press). *P. normandiana* material from France has been collected in the Tarn stream, a tributary of the river Garonne, South-Central of France, region 9a and in the Guiel stream, a calcareous Channel coastal stream, region 1a. Localities where the pharate adult male and pupal exuviae were recorded are lowland rhithral streams. Gravely and sandy beds in both lotic and lentic habitats, bryocolous and hygropteric microhabitats represent the most common substrata.

P. normandiana is apparently a very rare species in Europe occurring principally in permanent calcareous streams which deserve greater consideration and preservation. It is probably restricted to waters containing *Ephemera danica* larvae. Associated chironomid species commonly encountered in the same localities include *Macropelopia nebulosa* (Meigen, 1804), *Nilotanypus dubius* (Meigen, 1804), *Prodiamesa olivacea* (Meigen, 1818), *Brillia bifida* (Kieffer, 1909), *B. longifurca* (Johansen, 1905), *Epoicocladius ephemeræ* (Kieffer, 1924), *Eurycnemeus crassipes* (Meigen, 1810), *Bryophaenocladus nidorum* (Edwards, 1929), *B. muscicola* (Kieffer, 1906), *C. melaleucus* (Meigen, 1818), *Heleniella ornatocollis* (Edwards, 1929), *H. serratosioi* Ringe, 1976, *Krenosmittia camptophleps* (Edwards, 1929), *Metriocnemeus eurynotus* (Holmgren, 1883), *Parakiefferiella bathophila* (Kieffer, 1912), *Parametriocnemeus stylatus* (Spärck, 1923), *Paraphaenocladus impensus* (Walker, 1856), *P. irritus* (Walker, 1856), *Paratrachocladus rufiventris* (Meigen, 1830), *P. osellai* Rossaro, 1990, *Rheocricotopus effusus* (Walker, 1856), *R. fuscipes* (Kieffer, 1909), *Tvetenia calvescens* (Edwards, 1929), *T. verralli* (Edwards, 1929), *Micropsectra lindrothi* (Goetghebuer, 1931), *M. schrankelae* Stur & Ekrem, 2006, *Stempel-linella brevis* (Edwards, 1929), *Tanytarsus eminulus* (Walker, 1856) and *T. heusdensis* Goetghebuer, 1926.

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