



## A Curious new Caloneurodea from the Bashkirian of the Pas-de-Calais, France (Insecta Archaeorthoptera)

André Nel<sup>a</sup>, Patrick Roques<sup>b</sup>

<sup>a</sup>Institut de Systématique, Évolution, Biodiversité (ISYEB) Muséum national d'Histoire naturelle, CNRS, Sorbonne Université, EPHE, Université des Antilles, CP50, 57 rue Cuvier 75005 Paris, France. Email: [anel@mnhn.fr](mailto:anel@mnhn.fr); <https://orcid.org/0000-0002-4241-7651>

<sup>b</sup>2 Chemin des Processions, 93360 Neuilly Plaisance, France. Email: [patrick.roques93@wanadoo.fr](mailto:patrick.roques93@wanadoo.fr); <https://orcid.org/0000-0002-8721-9763>

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### ABSTRACT

We describe *Oudardgramma bruayensis* gen. et sp. nov., first representative of the small order Caloneurodea from the Bashkirian of Bruay-en-Artois. It is characterized by the very small size of the wing, and a unique pattern of the vein M+CuA+CuPa. As the previous oldest Caloneurodea were Moscovian, the new taxon corresponds to the oldest record of the order.

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### Introduction

The small archaeorthopteran order Caloneurodea is widely distributed during the Late Carboniferous and Permian (Béthoux et al., 2003; Dvořák et al., 2021 and references herein). With three genera and species recorded from the Moscovian of the Pas-de-Calais Basin, this area is of great interest to estimate the diversity of this order during the early Pennsylvanian (Nel & Roques, 2021). Here we describe a new genus and species based on a very small wing that shows unique highly specialized characters, from the Bashkirian of Bruay-en-Artois, discovered years ago by the second author in a slap heap.

### Material and methods

The drawing was done with a camera lucida on a Nikon SMZ1500. Photographs were taken using an AmScope camera MU900.

We follow the wing venation terminology of Béthoux and Nel (2002) and the classification of Béthoux et al. (2004).

Wing vein terminology: C, costa; CuA, cubitus anterior; CuP, cubitus posterior; CuPa, anterior branch of CuP; CuPa anterior branch of CuPa; CuPa posterior branch of CuPa; MA, median anterior vein;

MP, median posterior vein; RA, radius anterior; RP, radius posterior; ScP, subcosta posterior.

Zoobank xxxx

*Systematic palaeontology*

Superorder Archaeorthoptera Béthoux and Nel, 2002

Order Caloneurodea Handlirsch, 1937

Family uncertain

*Oudardgramma* gen. nov.

Zoobank xxxx

*Type species*

*Oudardgramma bruayensis* sp. nov.

*Diagnosis*

Wing characters only. MA touching RP near its base; CuPa fused with M+CuA near wing base; area between M+CuA+CuPa and R extremely narrow; stem of RP very long; ScP elongate.

*Etymology*

Named after Jacques Oudard in recognition to his important contribution to the study of fossil insects,

and the suffix ‘gramma’, frequently used for the caloneurodean genera. Gender feminine.

*Oudardgramma bruayensis* sp. nov.

(Fig. 1)

Zoobank xxxx

*Etymology*

Named after the type locality Bruay-en-Artois.

*Type material*

MNHN.F.A71355 (Bruay F.5, N° 25, counterimprint), stored at the Muséum National d’Histoire Naturelle, Paris, France.

*Type locality*

“Terril n° 5bis”, black Carboniferous shales, “Faisceau de Modeste”, “Veine Maroc” (Corsin 1932), 50°28’56”N 2°32’50”E. Bruay-la-Bussière, Pas-de-Calais, France.

*Stratigraphic occurrence*

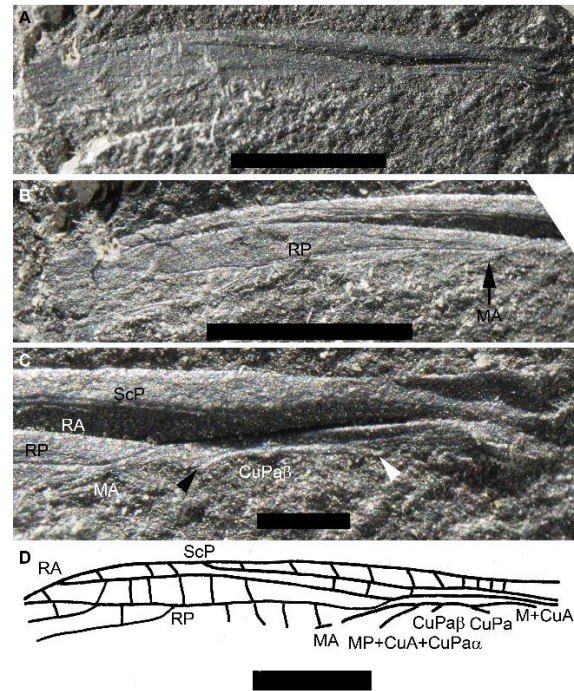
Pennsylvanian, Early Langsettian (= Early Westphalian A), Bashkirian Stage, Vicoigne Series.

*Diagnosis*

As for the genus. Only two short apical branches of RP.

*Description*

The anterior half of a small wing, 6.8 mm long; strongly concave ScP elongate, 4.5 mm long, closely parallel to convex R; area between ScP and C 0.20 mm wide, with a series of simple and short crossveins; area between ScP and R 0.18 mm wide, with at least three crossveins; concave RP emerging from R 2.1 mm from wing base; convex RA simple ending on C at ca. 0.8 mm from wing apex; three crossveins between C and RA; area between RA and RP relatively broad, 0.41 mm wide, with seven elongate crossveins, rather curved and perpendicular to RA and RP; stem of RP very long, 26.8 mm long, with two posterior branches apically; M+CuA very closely parallel to R, with the remnant of a vein (CuPa) posterior to it ending into it at 1.1 mm from wing base; a vein (CuPa□) re-emerging from M+CuA+CuPa 0.4 mm distally; area between M+CuA+CuPa and R extremely narrow, 0.1 mm wide; M+CuA+CuPa□ divided into MA and MP+CuA+CuPa□ 0.2 mm distal of base of CuPa□; MA touching RP just distal to its base; a broad area between stem of RP and MA, 0.45 mm wide, with at least four elongate crossveins in-between.



**Figure 1.** *Oudardgramma bruayensis* gen. et sp. nov., holotype MNHN.F.A71355. (A) photograph of wing; (B) distal part of wing; (C) basal part of wing, black arrowhead MP+CuA+CuPa□, white arrowhead CuPa; (D) reconstruction. Scale bars = 2 mm (A-B, D), 0.5 mm (C).

## Discussion

Although fragmentary, this wing has the typical characters of the superorder Archaeorthoptera, viz. a vein M+CuA closely parallel to R near wing base, and a more posterior vein ending into M+CuA near its base, herein interpreted as CuPa. Furthermore the shape of the veins ScP, RA, and RP is identical to those of the representatives of the Caloneurodea, viz. ScP simple, elongate and closely parallel to RA, a series of rather long crossveins in the area between RA and RP, and overall, a very long stem of RP with only two apical branches, and a broad area between stem of RP and M with elongate crossveins perpendicular to RP and M (e.g., resembling the pattern in *Plesiogramma medialis* Carpenter, 1943).

Nevertheless, this wing has a unique character distinguishing it from all the known Caloneurodea, viz. M is touching RP just distal to its base. Also its CuPa□ is basally ending into M+CuA, with CuPa□ and MP+CuA+CuPa□ re-emerging separately; instead of being CuPa□ fused with M+CuA, and CuPa□ being closely parallel to MP+CuA+CuPa□ in nearly all the Caloneurodea. Interestingly, *Paleuthygramma sharovi* Béthoux et al., 2004 and *Anomalogramma parva* Carpenter, 1943 have the vein CuPa□ emerging from a common vein M+CuA+CuPa, showing that this specialized structure occurs in some other Caloneurodea.

*Oudardgramma* gen. nov. is also remarkable in its very small size (6.8 mm long), with only *Nannogramma gandi* Béthoux et al., 2004 having a smaller wing, 6.4 mm long.

The lack of phylogenetic analysis of the whole order Caloneurodea forbids us to attribute *Oudardgramma* gen. nov. to a precise family.

### Conclusion

Béthoux et al. (2004) excluded *Geroneura wilsoni* Matthew, 1889 (Fern Ledges, Plant bed 2, Carleton, Saint John, Westphalian A, 318.1-314.6 Ma, estuary/bay shale, Lancaster Formation of Canada) from the Caloneurodea. It is an enigmatic taxon based on an incomplete wing, with the archaeorthopteran diagnostic characters not preserved. Thus *Oudardgramma bruayensis* gen. et sp. nov. corresponds to the oldest record of the Caloneurida.

Slap heap accumulations of rocks are of great interest for the knowledge of the Carboniferous insects of the North and Pas-de-Calais region. Some crucial discoveries have been made in these, especially in the slap heap of Avion, thanks to a collaboration with the society exploiting it (Nel et al., 2013). Unfortunately, they are currently either destroyed or converted into 'biodiversity' reserves without any chance to search after fossil material. Extensive programs of research would be essential to save this patrimony.

### Acknowledgements

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