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Zootaxa

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Abstract

The new Archaeorthoptera *Duquesnia gallica* **gen. et sp. nov.** Nel & Roques, is described from the upper Carboniferous of Northern France. It shows several putative synapomorphies with the three genera *Contracladus* Dvořák *et al.*, 2021 (Pennsylvanian of Germany), *Nugonioneura* (lower Permian of USA), and *Avionugonioneura* from the Moscovian of Avion (France).

Key words: Insecta, ?Nugonioneuridae, gen. et sp. nov., Late Carboniferous.

Introduction

The Nord-Pas-de-Calais region is well-known since a long time for its late Carboniferous entomofauna, extensively studied by Pruvost (1912, 1914 (1920), 1919) and more recently by our team, thanks to the new collects of two of us in the slag heap of Avion (P.R. & H.D.). The superorder Archaeorthoptera is especially diverse in these layers (Coty *et al.* 2014; Prokop *et al.* 2014; Schubnel *et al.* 2020; Nel *et al.* 2020). Here we describe a new fossil found in an ancient core sample of the area of Lens-Lievin. It shows several strong similarities with the two genera *Contracladus* (Pennsylvanian) and *Nugonioneura* Tillyard, 1937 (early Permian), and with *Avionugonioneura* Nel and Roques, 2021 from Avion (Nel & Roques, submitted).

Material and methods

The fossil was found by one of us (P.R.) in a core sample of the operating group of Lens-Lievin. It was examined under a Nikon SMZ1500 and photographed with an AmScope camera MU900. We follow the wing venation terminology of Béthoux & Nel (2002), supported by the 3D CT scan studies of Desutter-Grandcolas et al. (2017) and Schubnel et al. (2019). We also follow the 'orthopteroid' classification of Béthoux and Nel (2002), as supported by the pattern of venation and a series of strong synapomorphies of the superorder Archaeorthoptera.

Wing vein terminology: A, anal vein; C, costa; CuA, cubitus anterior; CuP, cubitus posterior; CuPa, anterior branch of CuP; CuPb, posterior branch of CuP; MA, median anterior vein; MP, median posterior vein; PCu, postcubital vein; RA, radius anterior; RP, radius posterior; ScP, subcosta posterior.

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Systematic palaeontology

Superorder Archaeorthoptera Béthoux and Nel, 2002

Family ?Nugonioneuridae Carpenter, 1976

Duquesnia **gen. nov.** Nel & Roques

LSID urn:lsid:zoobank.org:act:8F0CD6CF-99EA-466C-9D8B-F2A91CD2732E

Type species. *Duquesnia gallica* **sp. nov.** Nel & Roques

Diagnosis. Forewing characters only. CuPa ending into M+CuA and not in a free CuA; no CuPaβ, vein M distally forked; CuA+CuPa forked; ScP ending into RA; no short posterior branches of CuA+CuPa; three main branches of RP; area between RA and RP broad; CuPb posteriorly pectinate.

Etymology. Named after Mr Hervé Duquesne, who found the holotype.

Duquesnia gallica **sp. nov.**

(Figs. 1–2)

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Type material. Specimen Fa 0030/DH (a nearly complete forewing, very close but well-separated from two more poorly preserved hind wings, probably of the same specimen), stored at The Musée d'Histoire Naturelle de Grenoble, France.

Etymology. Named after Gallia, Latin name for France.

Type locality. Found in a core sample of the operating group of Lens-Lievin, Pas-de-Calais, France.

Stratigraphic occurrence. Moscovian (Westphalian C/D equivalent to Bolsovian/Asturian).

Diagnosis. As for the genus by monotypy.

Description. Forewing elongate, 9.8 mm long, 2.9 mm wide; ScP reaching RA at 6.1 mm from wing base; costal area rather narrow, 0.4 mm wide with a series of simple curved veinlets; no visible crossvein in area between ScP and R; RP separating from RA 3.9 mm from wing base; area between RA and RP broad, 0.6 mm wide, with one row of cells, apically

narrower; strongly convex RA with a series of short, more or less curved anterior veinlets between it and anterior wing margin; apex of RA 0.7 mm of wing apex; RP with three main posterior branches, two of them being twiged distally, parallel to M; RA and RP approximate in apical parts; a common stem R+M+CuA; convex M+CuA separating from R 3.1 mm from wing base, straight; M separating from CuA+CuPa 1.0 mm from base of M+CuA+CuPa; M with two simple branches; strongly convex CuA+CuPa forked; concave CuPa with an angle at point of separation between CuPa and CuPb, with stem elongate, 2.7 mm long; CuPa short, diverging vertically upward and ending into M+CuA; concave CuPb with three short posterior branches; convex PCu curved and simple in its preserved part.

Two strongly deformed and incomplete wings very close to the forewing. One shows three anal veins disposed in a small fan, two of them with distal forks (Figs. 1B, 2C).

Discussion

The veins of the forewing that we name CuPb and CuA+CuPa cannot belong to the other wing close to them because they have a quite different orientation with those of this second wing, and they are too far to belong to it. The forewing of this fossil resembles that of a 'Grylloblattodea' if we suppose that the vein that we name M+CuA is in fact the vein M with its two branches MA and MP; and that the vein we name CuPa is the strongly modified crossvein 'M5' between M and CuA (herein named CuPb); plus CuA emerging with CuP from a common stem Cu (Storozhenko, 1998). But the vein 'MP' under this hypothesis should be concave or at most neutral while it is strongly convex, and the vein 'CuA' should be convex, while it is clearly concave. Thus an attribution to the 'Grylloblattodea' is unlikely.

The presence of a convex basal stem of R+M+CuA in forewing is a character convergently present in the superorders Archaeorthoptera and Acercaria (Béthoux & Nel, 2002; Nel *et al.*, 2012). The presence of only few branches of RP, M, and CuA with only two branches

100 in the forewing, would suggest a position in the Acercaria Miomoptera or Hypoperlida sensu
101 Huang *et al.* (2016) and Prokop *et al.* (2017). The Miomoptera (Palaeomanteidae) have very
102 few, if none, crossveins between the branches of main veins, unlike *Duquesnia* gen. nov. There
103 are more such crossveins in the Hypoperlida Hypoperlidae. But *Duquesnia* gen. nov. has the
104 main characteristic of the Palaeomanteidae compared to the Hypoperlidae, viz. a elongate stem
105 M+CuA. Furthermore, both Hypoperlidae and Palaeomanteidae have a pterostigmal zone
106 around apex of RA, absent in the forewing of *Duquesnia* gen. nov., but possibly present in its
107 hind wing. If *Duquesnia* gen. nov. was an Acercaria, the vein more basal to CuA would be CuP,
108 but this vein is posteriorly pectinate, unlike nearly all the Acercaria, except for the
109 Carboniferous hemipteran *Protoprosbole* Laurentiaux, 1952 (Nel *et al.*, 2012: fig. 3H). The
110 putative hind wing of *Duquesnia* gen. nov. has a well-developed anal area with three main
111 branches while the Hypoperlidae and Palaeomanteidae have reduced anal areas in hind wing
112 (Tillyard, 1928; Rasnitsyn, 1980: fig. 13; Prokop *et al.*, 2017). Also, in the Acercaria, the vein
113 between CuA and CuP is a specialized crossvein cua-cup basally concave and distally convex
114 (Nel *et al.*, 2012). In the Archaeorthoptera, the vein in the same position is concave and an
115 anterior branch of CuP. In *Duquesnia* gen. nov., this vein is clearly concave. Thus it is likely
116 the anterior branch CuPa of CuP. Lastly, the vein that is basad to CuP is convex and corresponds
117 to the vein PCu. An apically forked CuPb is present in some Archaeorthoptera like *Gerarus*
118 Scudder, 1885 or *Osnogerarus* Kukalová-Peck & Brauckmann, 1992 (Béthoux & Nel, 2002:
119 figs 12-13). Thus, an attribution of *Duquesnia* gen. nov. to the Archaeorthoptera nec
120 Panorthoptera is the most probable hypothesis, because of the absence of a fork of CuPa into
121 two branches CuPa□ and CuPa□.
122 Within this clade, *Duquesnia* gen. nov. has a very particular pattern of the vein
123 M+CuA+CuPa, viz. CuPa reaches M+CuA well basad to the point of separation between M
124 and CuA. Similar patterns are present in few Archaeorthoptera, and only in *Bruaylogus*

magnificus Coty *et al.*, 2014 among the Panorthoptera. *Bruaylogus* strongly differs from *Duquesnia* gen. nov. in the presence of two branches CuPa□ and CuPa□ of CuPa, of secondary branches of the two branches of M and of several posterior branches of CuA+ CuPa□ (Coty *et al.*, 2014: fig. 2). The other Archaeorthoptera with a vein M+CuA+CuPa are *Contracladus impar* Dvořák *et al.*, 2021 (Carboniferous, Germany), *Nugonioneura problematica* Tillyard, 1937 (Permian, USA), plus *Avionugonioneura jouaulti* Nel and Roques, 2021 from the Moscovian of Avion (Pas-de-Calais, Prance) (Nel & Roques, 2021). All these fossils have no vein CuPa□, excluding them from the Panorthoptera. *Contracladus* differs from *Duquesnia* gen. nov. in the presence of 7-8 branches of RP, instead of only three, and of six branches of CuA+CuPa instead of only two (Dvořák *et al.*, 2021: fig. 1). *Nugonioneura* differs from *Duquesnia* gen. nov. in the presence of three branches of CuA+CuPa, of more numerous veinlets between RA and anterior wing margin (Aristov, 2020: Figs 3-4). But they both share with *Duquesnia* gen. nov. a ScP ending into RA. *Avionugonioneura* differs from *Duquesnia* gen. nov. in the simple M, presence of seven branches of RP, a very long anterior branch of CuA+CuPa, and a ScP ending into anterior wing margin instead of RA. Nevertheless, they share the presence of numerous anterior veinlets between RA and anterior wing margin (Nel & Roques, 2021).

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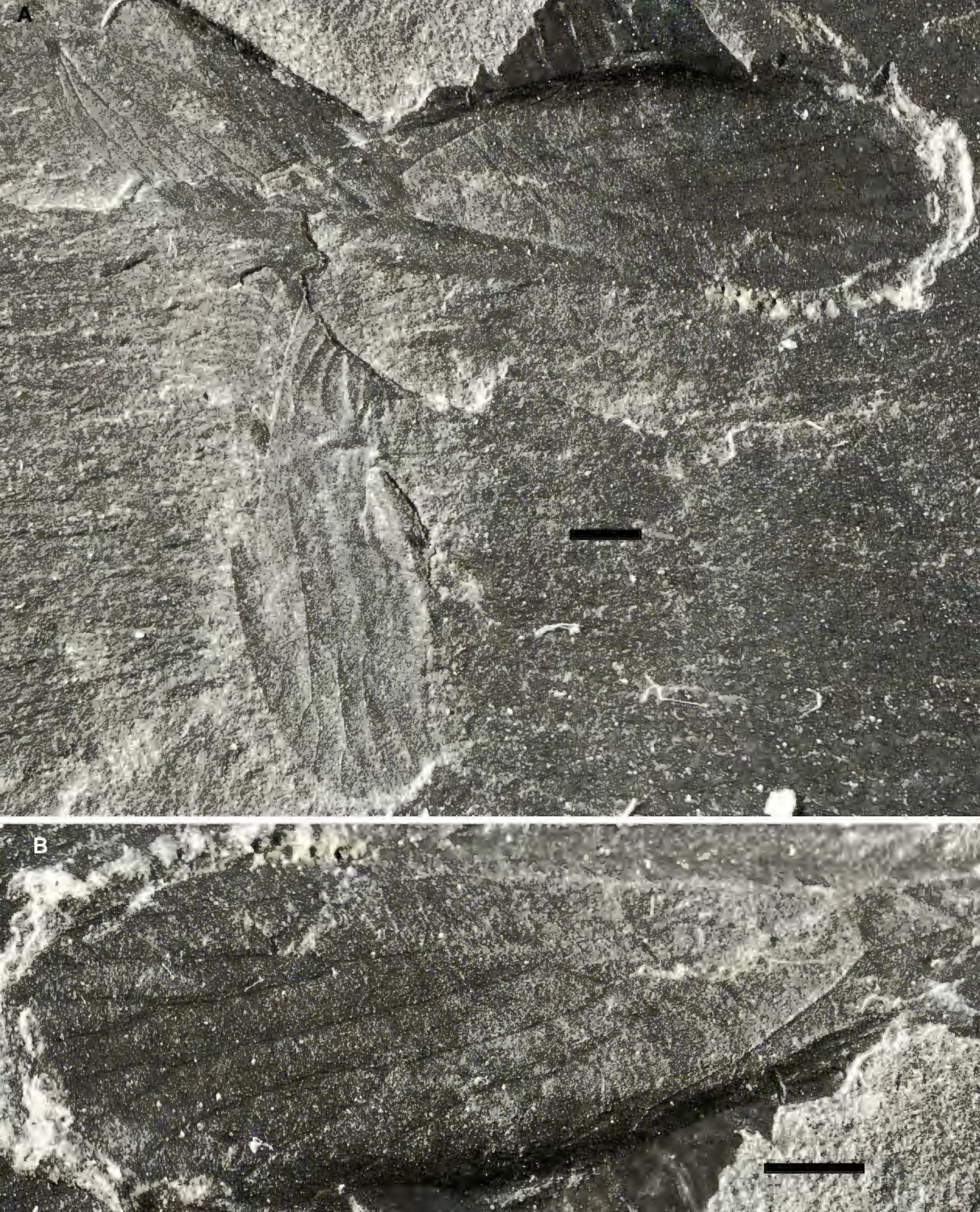
FIGURE 1. *Duquesnia gallica* **gen. et sp. nov.**, holotype Fa 0030/DH. Photograph. (A) fore- and putative hind wings; (B) forewing. Scale bars = 1 mm.

224 **FIGURE 2.** *Duquesnia gallica* **gen. et sp. nov.** , holotype Fa 0030/DH. Reconstructions of
225 wings. (A) forewing; (B) putative hind wing; (C) putative hind wing. Scale bars = 1 mm.
226


A
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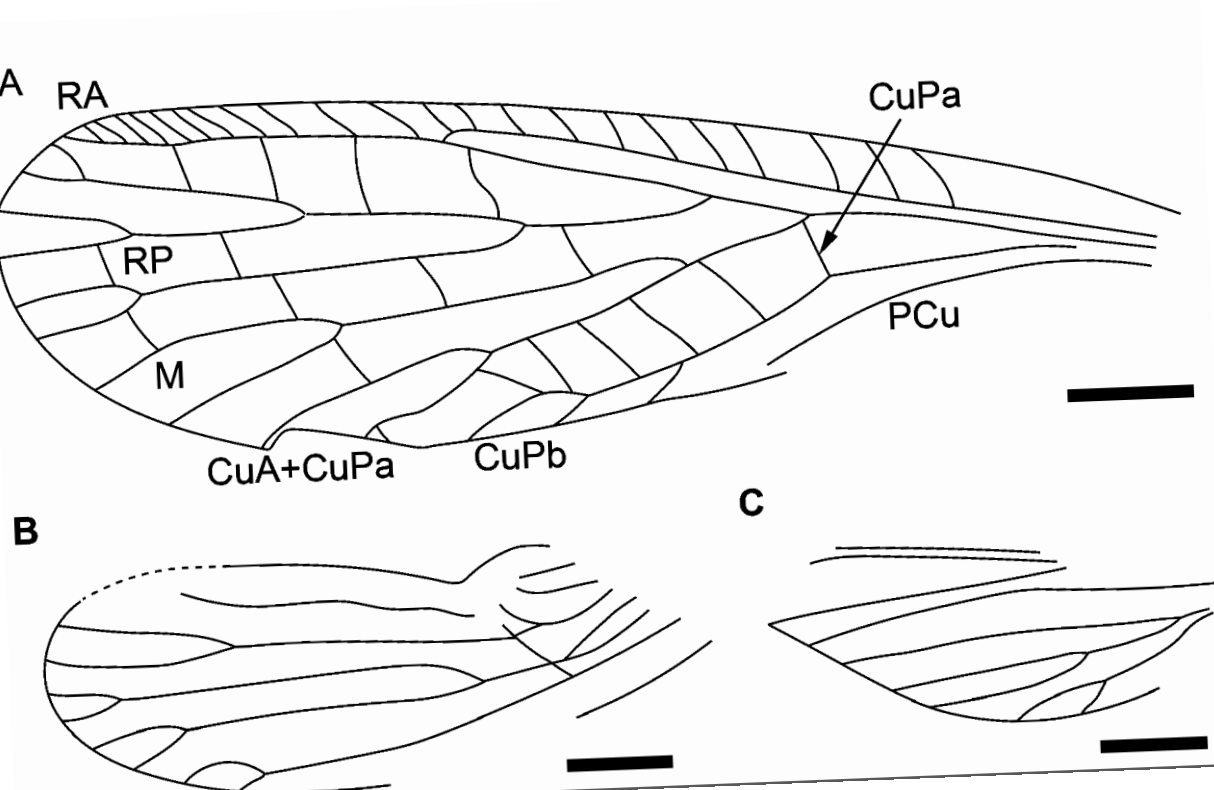
A
RA
CuPa
RP
PCu
M
CuA+CuPa
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