



ELSEVIER

Contents lists available at ScienceDirect

## Comptes Rendus Palevol

www.sciencedirect.com



General palaeontology, systematics and evolution

# The oldest record of the grylloblattodean family Euryptilonidae discovered in the Late Carboniferous of France



*Le plus ancien fossile de la famille Euryptilonidae (Grylloblattodea) découvert dans le Carbonifère supérieur de la France*

Justine Myskowiak<sup>a</sup>, Jean-Marc Pouillon<sup>b</sup>, André Nel<sup>c,\*</sup><sup>a</sup> Résidence Croix-du-Sud, rue Henry-de-Montherlant, 33400 Talence, France<sup>b</sup> 178, rue des Plattières, 38300 Nivolas Vermelle, France<sup>c</sup> Muséum national d'histoire naturelle, Institut de systématique, evolution, biodiversité, ISYEB, UMR 7205 CNRS UPMC EPHE, CP50, 45, rue Buffon, 75005 Paris, France

## ARTICLE INFO

## Article history:

Received 24 June 2014

Accepted after revision 30 August 2014

Available online 7 November 2014

## Keywords:

France

Late Carboniferous

Gzhelian

Insecta

Neoptera

Euryptilonidae

Gen. et sp. n.

## Mots clés :

France

Carbonifère supérieur

Gzhélien

Insecta

Neoptera

Euryptilonidae

Gen. et sp. n.

## ABSTRACT

A new insect fossil from the Late Carboniferous lacustrine deposits of Montceau-les-Mines is attributed to a new genus and species, *Montceapterum bailyi* of Euryptilonidae (Grylloblattodea). It is based on forewing venation but it shows also membranous lateral extensions on the pronotum, maybe corresponding to prothoracic winglets. It represents the oldest record of the family, previously known only from the Permian.

© 2014 Académie des sciences. Published by Elsevier Masson SAS. All rights reserved.

## R É S U M É

Un nouvel insecte fossile des dépôts lacustres du Carbonifère supérieur (Gzhélien) de Montceau-les-Mines est attribué au nouveau genre et espèce *Montceapterum bailyi* de la famille Euryptilonidae (Grylloblattodea). Il est basé sur la nervation de l'aile antérieure mais montre aussi des extensions prothoraciques latérales membraneuses, peut-être correspondant à des « ailettes » prothoraciques. Il représente le plus ancien fossile connu de cette famille, qui n'était auparavant décrite qu'au Permien.

© 2014 Académie des sciences. Publié par Elsevier Masson SAS. Tous droits réservés.

## 1. Introduction

The grylloblattodean family Euryptilonidae Martynov, 1940 currently comprises 14 described genera from the Permian of Europe, Asia, and North America (Aristov, 2002).

\* Corresponding author.

E-mail addresses: justine.myskowiak@gmail.com (J. Myskowiak), jmpdb@wanadoo.fr (J.-M. Pouillon), anel@mnhn.fr (A. Nel).

These insects are mainly known from their forewing structures, the bodies and hindwings being rare and generally rather poorly preserved. Here we describe the first record of a representative of this family from France, corresponding to its first Late Carboniferous and its oldest record.

## 2. Material and method

The fossil was found in the Saint Louis quarry situated to the north, northwest of Montceau-les-Mines city, in direction of Blanzay town, department of Saône-et-Loire (71), France (Charbonnier, 2014). The age, depositional conditions, and stratigraphy are also summarized in Charbonnier et al. (2008). This quarry was located between the quarries of La Sorme and St François, all in activity between 1975 and 1980, opened for coal extraction by the French company 'les Houillères de Blanzay'. The coal level exploited was named 'Couche n° 1'. It is the top coal-level from the 'Faisceau des grandes couches de l'assise de Montceau' (figure and Log in Charbonnier, 2014). The insect is in a nodule from the 'Couche à nodules', situated at around 20 m above the last level of coal of the 'Couche n° 1'. This layer has yielded a lot of insects, crustaceans (Syn-carida, Conchostrea), arachnids, fishes, tetrapods or bones of tetrapod, and plants. Although many insects were found in these nodules, comparatively few have been described or figured (Béthoux and Nel, 2010; Burnham, 1981, 1983, 1984, 1985, 1986, 1994; Garwood et al., 2012; Langiaux, 1984; Langiaux and Parriat, 1974, 1975a, 1975b, 1975c; Oudard, 1980).

The fossil specimen is preserved as a sub-tridimensional gently pyritized compression in a sideritic nodule. The specimen was observed under an Olympus SZX-9 stereomicroscope under film layer of ethyl alcohol. The venation pattern was drawn directly using a stereomicroscope with a camera lucida, and finally readjusted to the photograph scales using image-editing software (Adobe Photoshop). Photographs were made using an Olympus 5050 digital camera connected to the stereomicroscope.

We follow the wing vein nomenclature and systematics proposed by Storozhenko (1998, 2002). Abbreviations of wing venation symbols throughout the text and the figures are given as: A, anal veins; CuA, cubitus anterior; CuP, cubitus posterior; MA, media anterior; MP, media posterior; RA, radius anterior; RP, radius posterior; Sc, subcosta posterior.

## 3. Systematic palaeontology

Order: GRYLLOBLATTODEA Walker, 1914  
Clade: LEMMATOPHORINA Storozhenko, 1997  
Family: EURYPTILONIDAE Martynov, 1940

*Montceapterum* gen. n.

Type species: *Montceapterum bailyi* sp. n., by monotypy.

Etymology. Named after Montceau-les-Mines and 'pterum' for wing. Gender masculine.

Diagnosis. Characters concern forewing only: clear division of CuA into well-defined CuA1 and CuA2; CuA1 with broad distal area and three long branches ending on

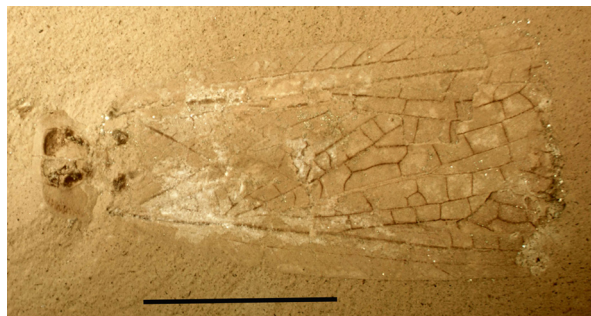


Fig. 1. *Montceapterum bailyi* gen. et sp. n., holotype JMP.365.B, photograph of habitus (scale bar 5 mm).

Fig. 1. *Montceapterum bailyi* gen. et sp. n., holotype JMP.365.B, photographie de l'habitus (barre d'échelle 5 mm).

posterior wing margin; CuA1 touching median vein in one point; area between CuP and CuA basally broadened; Sc not ending on radius in distal part of wing; RP probably with few distal branches; MA simple; MP distally forked into two simple branches.

*Montceapterum bailyi* sp. n.

(Figs. 1–4)

Etymology. Named after Mr Maurice Bailly, who discovered this fossil, 35 years ago.

Locus typicus and stratum typicum. Gzhelian, Late Pennsylvanian, Upper Carboniferous (Charbonnier et al., 2008), sideritic concretion outcrop of Saint Louis quarry, Montceau-les-Mines, France.

Material. Holotype specimen JMP.365.B (thorax with remnants of at least three wings visible, coll. Bailly), housed in the private collection of Jean-Marc Pouillon.

Remark. This specimen was figured in Langiaux (1984: 195, fig. 317), as an undetermined insecta 'forme 6'.

Diagnosis. As for the genus.

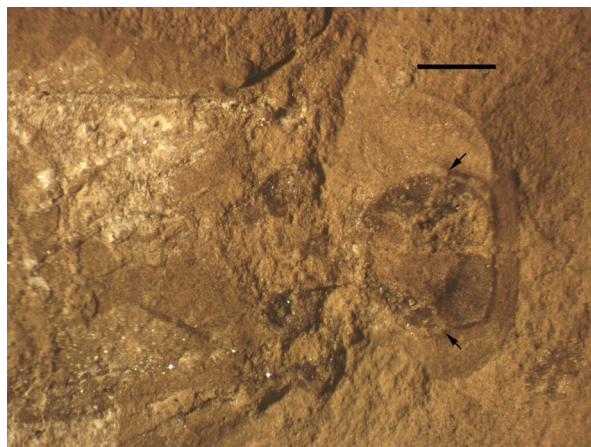
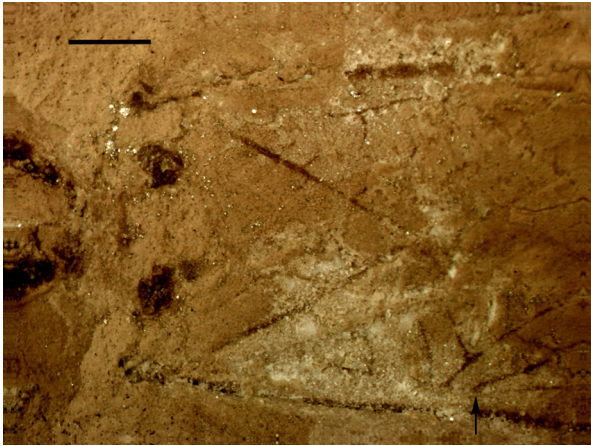


Fig. 2. *Montceapterum bailyi* gen. et sp. n., holotype JMP.365.B, photograph of thorax (arrows: possible point of attach of the lunular membranous extensions) (scale bar 1 mm).

Fig. 2. *Montceapterum bailyi* gen. et sp. n., holotype JMP.365.B, photographie du thorax (flèches: point d'attach possible des extensions membraneuses lunulaires) (barres d'échelle 1 mm).

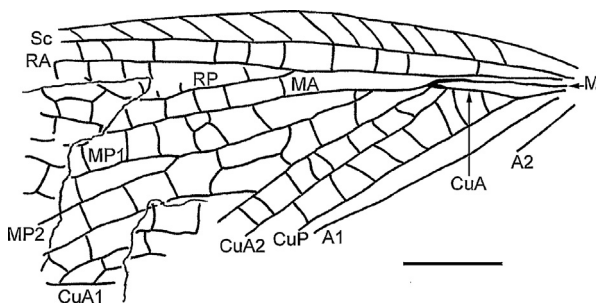


**Fig. 3.** *Montceapterum baillyi* gen. et sp. n., holotype JMP.365.B, photograph of mesothorax with forewing bases and coxae of midlegs (scale bar 1 mm).

**Fig. 3.** *Montceapterum baillyi* gen. et sp. n., holotype JMP.365.B, photographie du mésothorax avec les bases des ailes antérieures et les coxae médianes (barre d'échelle 1 mm).

**Description.** Head, abdomen, and legs not preserved. Pronotum rounded, 1.5 mm long and 1.7 mm wide, with an anterior narrow depressed zone, 0.3 mm long and 1.6 mm wide; pronotum divided into two parts by a median furrow; two lateral lunular membranous extensions showing traces of rudimentary veins, 1.0 mm wide and 2.0 mm long, possibly attached to pronotum in one point (Fig. 2); mesothorax partly visible, showing two rounded dark depressions, 1.0 mm apart, possibly corresponding to insertions of mid coxae.

Wings (Figs. 3 and 4) covering posterior part of body as a roof; length of forewing fragment ca. 11.0 mm, probable total length ca. 13.6 mm, width in widest part 5.0 mm; costal area 1.0 mm wide, rather broad in middle of wing, bearing 13 preserved crossveins, all simple; Sc straight, apically deflected but probably reaching costal margin 4.0 mm from edge of wing; R not really straight, RA and RP separating at about approximately midway of wing length from base, 5.8 mm from wing base; RA simple and straight; area between RA and RP with numerous crossveins (seven of them being preserved); stems of M and R very close running



**Fig. 4.** *Montceapterum baillyi* gen. et sp. n., holotype JMP.365.B, line drawing of forewing (scale bar 2 mm).

**Fig. 4.** *Montceapterum baillyi* gen. et sp. n., holotype JMP.365.B, dessin au trait de l'aile antérieure (barre d'échelle 2 mm).

parallel for a short distance, area between M and radius basal of RP poorly preserved so that the possible crossveins are not visible; M divided into MA and MP 2.3 mm basal of separation of RA and RP; MA simple, nearly straight, not approximating RP; area between RP and MA numerous crossveins (five of them being preserved); base of MP ca. 8 mm from wing base, bifurcated about mid-wing and reaching posterior wing margin with two branches; MP area narrow with seven preserved crossveins between MA and MP; CuA basally strongly diverging from CuP towards M, connected to it for 0.3 mm, and with two basal branches CuA1 and CuA2; CuA1 divided into three distal branches; CuA2 simple; CuP simple and nearly straight; area between CuA and CuP with one row of large transverse cells; anal area poorly preserved but with simple straight A1 and fragments of A2 visible.

#### 4. Discussion

Following the key to the “grylloblattodean” families of Storozhenko (1998: 65–67), it is quite delicate to discriminate among several families because one crucial node number ‘20(59)’ of this key concerns the ‘clear division of CuA into well-defined CuA1 and CuA2’ versus ‘CuA not clearly divided into CuA1 and CuA2’. It is supposed to discriminate between the Euryptilonidae Martynov, 1940 (supposed to have no clear division of CuA) and the Pinideliidae Storozhenko, 1997 for instance (supposed to have a clear division of CuA). But the euryptilonid genus *Oborella* Kukulová, 1964 and the pinideliid genus *Pinidelia* Storozhenko, 1994 both have a well-defined CuA2 (Storozhenko, 1998: figs 150 and 240). Therefore, it is quite delicate to use this key.

Nevertheless, this fossil has important diagnostic characters of the Euryptilonidae, and more precisely with the genus *Oborella* Kukulová, 1964, i.e. pronotum with broad membranous lateral extensions and an anterior transverse zone; costal area rather narrow with simple crossveins; Sc not ending on radius but on costa; RP with few distal branches; MA simple; MP with a distal fork into two simple branches; CuA1 with distal fork(s); CuA2 well-defined and simple; area between CuP and CuA basally broadened; CuA touching median vein in one point; crossveins simple (Prokop et al., 2012; Storozhenko, 1998). We compare our fossil to the different euryptilonid genera as listed in Storozhenko (1998).

*Montceapterum* gen. n. differs from *Euryptilon* Martynov, 1940 and *Karaungirella* Storozhenko, 1991 in the shape of CuA divided into CuA1 and CuA2 instead of being anteriorly pectinate. Note that *Euryptilon cuculiphoris* Aristov, 2002 is based on a very poorly preserved specimen with only fragments of forewing veins preserved (Aristov, 2002). It shares with *Stereopterum* Carpenter, 1950 the division CuA1–CuA2, but its CuA and M are not fused for a long distance, unlike in *Stereopterum* and *Karaungirella*. *Quercopterum* Kukulová, 1964, *Maculopterum* Kukulová, 1964, *Villopterum* Kukulová, 1964, and *Oborella* have also a clear CuA2 but CuA1 defines a reduced area unlike *Montceapterum*. *Sharovipterum* Kukulová, 1964 has a shorter Sc than *Montceapterum*, ending on costal margin three cells distal of base of RP. Only *Torrentopterum*



Kukalová, 1964 has a CuA2 well-defined and CuA1 defining a broad distal area with three long branches of CuA1 ending on posterior wing margin. Nevertheless, it differs from *Montceaupterum* in the MP simple. Lastly the genus *Stereosylva* Aristov, 2002, originally attributed to the Euryptilonidae, was later transferred into the Soyanopteridae Aristov and Rasnitsyn, 2011 (Aristov and Rasnitsyn, 2011).

The Euryptilonidae are currently recorded only in the Permian (Storozhenko, 1998), thus the Late Carboniferous *Montceaupterum* can be considered as the oldest record of the family.

## Acknowledgements

We thank two anonymous referees for their helpful remarks on the first version of the paper. We sincerely thank Mrs. Bailly and Mr. Michel Fournier for their collaboration in the nearly complete preservation of the Collection Bailly. We also thank Mr. Pierre Debriette, Geologist at the Houillères de Blanzly, for information.

## References

- Aristov, D.S., 2002. New euryptilonids (Insecta: Grylloblattida; Euryptilonidae) from the Lower Permian of the Urals (Russia). *Neues Jahrb. Geol. Paläontol., Monat.* 2002, 252–256.
- Aristov, D.S., Rasnitsyn, A.P., 2011. A new eoblattid (Insecta: Eoblattida) from the Permian of Russia. *Far Eastern Entomol.* 230, 1–12.
- Béthoux, O., Nel, A., 2010. Description of a new grylloblattidan insect from Montceau-les-Mines (Late Carboniferous; France) and definition of Phenopterum Carpenter, 1950. *Syst. Entomol.* 35, 546–553.
- Burnham, L., 1981. Fossil insects from Montceau-les-Mines (France): a preliminary report. *Bulletin de la Société d'histoire naturelle d'Autun* 100, 5–9.
- Burnham, L., 1983. Studies on the Upper Carboniferous insects: 1. The Geraridae (order Prothoptera). *Psyche* 90, 1–57.
- Burnham, L., 1984. Les insectes du Carbonifère supérieur de Montceau-les-Mines. 1. L'ordre des Caloneurodea. *Ann. Paléontol.* 70, 167–180.
- Burnham, L., 1985. The Upper Carboniferous insect fauna of Montceau-les-Mines. *Bulletin de la Société d'histoire naturelle d'Autun* 116, 79–96.
- Burnham, L., 1986. Studies on Upper Carboniferous Insects. 2. The Spanioderidae (Order Protorthoptera). Unpublished Ph.D. thesis. Cornell University, Ithaca, NY, USA.
- Burnham, L., 1994. The Stephanian (Late Carboniferous) Insects of the Basin of Montceau-les-Mines (Massif Central, France). 10 p. In: Poplin, C., Heyler, D. (Eds.), *Quand le Massif central était sous l'équateur – Un écosystème carbonifère à Montceau-les-Mines. Mémoires de la section des sciences, n° 12, Éditions du Comité des travaux historiques et scientifiques*, 331 p.
- Charbonnier, S., 2014. Synthèse sur la flore des nodules du Lagerstätte de Montceau-les-Mines (Carbonifère supérieur, France). *Ann. Paléontol.* 100, 103–117.
- Charbonnier, S., Vannier, J., Galtier, J., Perrier, V., Chabard, D., Sotty, D., 2008. Diversity and paleoenvironment of the flora from the nodules of the Montceau-les-Mines biota (Late Carboniferous, France). *Palaios* 23, 210–222.
- Garwood, R., Ross, A., Sotty, D., Chabard, D., Charbonnier, S., Sutton, M., Withers, P.J., 2012. Tomographic reconstruction of neopterous Carboniferous insect nymphs. *PLoS One* 7 (9), 1–10, e45779.
- Langiaux, J., 1984. Flores et faunes des formations supérieures du Stéphaniens de Blanzly-Montceau (Massif central français). *Stratigraphie et paléoécologie. La Physiophile, Société d'études des sciences naturelles et historiques de Montceau-les-Mines, Supplément* 100, 270 p.
- Langiaux, J., Parriat, H., 1974. Faune entomologique du bassin de Blanzly-Montceau. *La Physiophile, Société d'études des sciences naturelles et historiques de Montceau-les-Mines* 81, 62–74.
- Langiaux, J., Parriat, H., 1975a. Entomofaune du bassin de Blanzly-Montceau - Nouvelles acquisitions. *La Physiophile (N.S.)* 82, 35–45.
- Langiaux, J., Parriat, H., 1975b. Entomofaune du bassin de Blanzly-Montceau, nouvelles acquisitions. *La Physiophile (N.S.)* 83, 35–45.
- Langiaux, J., Parriat, H., 1975c. Blattes fossiles du bassin de Blanzly-Montceau. *La Physiophile (N.S.)* 83, 45–56.
- Oudard, J.L., 1980. Les insectes des nodules du Stéphaniens de Montceau-les-Mines. *Bulletin de la Société d'histoire naturelle d'Autun* 94, 37–51.
- Prokop, J., Weiß, K.-D., Dechambre, R.-P., Nel, A., 2012. Early Permian insects from Saar-Nahe Basin of Odernheim, Rheinland-Pfalz in Germany (Insecta: Grylloblattida, Blattinopseida). *Geodiversitas* 34, 271–281.
- Storozhenko, S.Y., 1998. Sistematika, filogeniya i evolyutsiya grylloblattidovykh nasekomykh (Insecta: Grylloblattida) [Systematics, phylogeny and evolution of the grylloblattids (Insecta: Grylloblattida)]. *Dal'nauka, Vladivostok*, pp. 1–207 [in Russian].
- Storozhenko, S.Y., 2002. Chapter 2.2.2.1. Order Grylloblattida Walker, 1914 (=Notoptera Crampton, 1915, =Grylloblattodea Brues et Melander, 1932, +Protorthoptera Handlirsch, 1906, =Paraplecoptera Martynov, 1925, +Protoperlaria Tillyard, 1928). pp. 278–284. In: Rasnitsyn, A.P., Quicke, D.L.J. (Eds.), *History of Insects*. Kluwer Academic Publishers, Dordrecht, Boston, London, xi + 517 p.