

# A new Geraridae (Insecta, hemipteroid stem assemblage) from the Upper Carboniferous of La Magdalena (León, Northern Spain)

C. Brauckmann<sup>(1)</sup>, A. Arillo<sup>(2)</sup> y V. M. Ortuño<sup>(3)</sup>

(1) Institut für Geologie und Paläontologie, Technische Universität Clausthal, Leibnizstrasse 10, D-38678 Clausthal-Zellerfeld, Germany  
E-mail: Carsten.Brauckmann@tu-clausthal.de

(2) Departamento de Zoología (Entomología), Facultad de Biología, Universidad Complutense, 28040 Madrid, Spain  
E-mail: aarillo@teleline.es

(3) Departamento de Biología (Zoología), Facultad de Ciencias, Universidad Autónoma de Madrid, 28049 Madrid, Spain  
E-mail: ildotre@retemail.es

## ABSTRACT

Beside the previously described *Cantabrala gandli* Kukalová-Peck & Brauckmann, 1992, a second isolated insect wing belonging to the hemipteroid stem-assemblage family Geraridae is described from the late Carboniferous (Stephanian B) of La Magdalena, Province of León, Northern Spain, as *Omalia anae* n. sp. Generally, its venation is similar to the type species, *O. macroptera*, but in detail it differs mainly by (1) the distinctly smaller dimensions, (2) the obviously narrower subcostal area with the shorter ScP-, (3) the extremely broader area of MP- with evidently more branches, (4) the concave branches of CuP- and of the anal forks, and (5) the wider and more regular cross veins.

Key words: Carboniferous, Geraridae, Insecta, new species, *Omalia*, Spain

## ***Nuevo Geraridae (Insecta, Hemipteroideo basal) del Carbonífero Superior de La Magdalena (León, Norte de España)***

### RESUMEN

En el presente trabajo se describe *Omalia anae* sp. nov., basada en un ala aislada perteneciente a la familia Geraridae (grupo basal de hemipteroideos), hallada en La Magdalena (León, España) y datada como Carbonífero Superior (Estefaniense B). Se trata de la segunda cita de esta familia en España tras la descripción de *Cantabrala gandli* Kukalová-Peck & Brauckmann, 1992. La venación es similar a la especie tipo *O. macroptera*, pero se distingue por (1) sus menores dimensiones, (2) un área subcostal más estrecha con la vena ScP- más corta, (3) un área de MP- mucho más ancha y con más ramificaciones, (4) unas ramas cóncavas en CuP- y en la ramificación anal y (5) en la presencia de venas transversas más numerosas y anchas.

Palabras clave: Carbonífero, España, Geraridae, Insecta, nueva especie, *Omalia*

### Introduction

Carboniferous insects are hitherto very rare in Spain. Neither Handlirsch (1922) nor Hennig (1981) in their comprehensive studies mention any finds. When describing *Anchineura hispanica* (Megasecoptera) and an unnamed cockroach tegmen (Blattodea), Carpenter (1963) presented the first two isolated wings, the first one from the Stephanian B of La Magdalena, Province of León and the latter from the

“Upper Carboniferous” (without detailed allocation) of the Mina da Poleiro in northwestern Spain. A second blattodean wing from the early Stephanian (Lower Cantabrian) of Ocejo de la Peña, Province of León, was listed by Schneider (1983a). Two further blattodean wings have been described by Álvarez-Ramis (1990) from the late Stephanian B of Villablino, Province of León; in the revised systematics by Schneider (1983b), at least one of them may belong to *Compsoblatta ovata* (Meunier, 1921). Another iso-

lated wing, *Cantabrala gandli*, from Lores, Province of Palencia, was added by Kukalová-Peck & Brauckmann (1992), when *Cantabrala gandli* was described Lores outcrop was considered as Stephanian B but now it is considered as Westfalian D (Peñalver et al., 1999); together with other finds, it raised evidence that most Palaeozoic "Protorthoptera" really represent ancestral hemipteroids, while protorthopterans are nothing more than a waste basket of non-understood insects.

A first brief comment on the hitherto known insect remains from the Carboniferous of Spain has been supplied by Brauckmann (1993). Peñalver et al. (1999) presented a complete compilation of the whole record of fossil insects from Spain, including also each of the previously described Carboniferous species, and added several further new finds, some of them not yet described. According to the latter authors, Carboniferous insects in Spain are now known from the Westphalian A (Langsettian), Westphalian D (Westphalian s. str.), early Stephanian (Cantabrian), Stephanian B, and Stephanian C.

Besides *Cantabrala gandli*, the new wing represents another new species of the gerarid-line of the hemipteroid stem-assemblage which can rather easily be grouped with the Geraridae. Due to the general morphology of the venation and to avoid an excessive splitting in less understood genera, we place it within the genus *Omalia* van Beneden & Coemans, 1867 where it seems to be kept best until a complete monographic revision of the whole genus shows a better way.

## Systematic Palaeontology

### Neoptera

Hemipteroid stem-assemblage *sensu*

Kukalová-Peck & Brauckmann 1992

Gerarid line *sensu*

Kukalová-Peck & Brauckmann, 1992

Family Geraridae Scudder, 1885 *sensu*

Kukalová-Peck & Brauckmann, 1992

Synonymy: See Burnham (1983) and Kukalová-Peck & Brauckmann (1992).

Diagnosis: See Kukalová-Peck & Brauckmann (1992: 2466-2468).

Taxa and their distribution: See Kukalová-Peck & Brauckmann (1992: 2454) and below.

Remarks: The Geraridae have been revised in detail

by Burnham (1983). She included the families Sthenaropodidae Handlirsch, 1906 as well as the Genopterygidae Richardson, 1956, and convincingly reduced the number of species from 21 (in 7 genera) to 10 (in 6 genera). Like most earlier and some subsequent authors, she placed them within the evidently polyphyletic "order" Protorthoptera Handlirsch, 1906. Kukalová-Peck & Brauckmann (1992) presented evidence that the body structure and wing venation of the Geraridae do not agree with the orthopteroid ground plan and that they belong to the hemipteroid stem-assemblage. To the list of genera and species of the Geraridae they added *Omalia* van Beneden & Coemans, 1867 (species listed below), *Axiologus thoracicus* Handlirsch, 1906, *Platyphlebopteron jakobyi* Germer, 1971, *Osnogerarus trecwithiensis* Kukalová-Peck & Brauckmann, 1992 and *Cantabrala gandli* Kukalová-Peck & Brauckmann, 1992 which extends the number of species now (including the new species described herein) to 17 (in 11 genera).

Altogether, the Geraridae are known from North America and Western and Central Europe (Spain, France, Belgium, England and Germany) with a strong peak in the Mazon Creek area. They are documented from the Westphalian A (Langsettian) to the Stephanian B; this corresponds to a total range over nearly 15 million years. The oldest record is *Omalia macroptera* van Beneden & Coemans, 1867 from the Westphalian A (Langsettian) in Belgium.

Best known species are *Gerarus vetus* Scudder, 1885 and *G. cf. danielsi* Handlirsch, 1906, both from the Westphalian D of Mazon Creek, Illinois, U.S.A., which are documented by rather completely preserved specimens including head, body (with ovipositor in the latter taxon) wings and parts of the legs (see Kukalová-Peck & Brauckmann, 1992: figs. 1-4 and 22-25).

The references to most of the authors of the taxa cited in the present article are listed in Kukalová-Peck & Brauckmann (1992).

### *Omalia* van Beneden & Coemans, 1867

Type species: *Omalia macroptera* van Beneden & Coemans, 1867.

Diagnosis (after Carpenter, 1992: 121): "Little known fore wing; costal area broad; first fork of CuP beyond anastomosis with CuA" (to be revised in a planned monographic study on *Omalia* species).

Species and their distribution (*vide* Brauckmann & Hahn, 1980):

– (1) *Omalia macroptera* van Beneden & Coemans, 1867 (type species), Westphalian A, La Louvière, Province Hainaut (Belgium);

– (2) *O. carbonis* (Handlirsch, 1904) (= type species of *Palaeomastax* Handlirsch 1904, which has also been treated as a synonym of *Omalia* by Carpenter, 1992), Westphalian C, Frameries (Belgium);

– (3) *O. palmiformis* (Bolton, 1922) (= type species of *Coselia* Bolton, 1922 which again has been accepted by Carpenter, 1992 in spite of the fact that it is more similar to *O. macroptera* than *O. carbonis*!), Westphalian B, Coseley near Dudley (Great Britain);

– (4) *O. anae* n. sp., Stephanian B, La Magdalena, Province of León, northern Spain.

In the present conception, *Omalia* ranges from the Westphalian A to the Stephanian B.

*Omalia anae* n. sp.

Fig. 1

Holotype: Specimen no. MGM-2330-H stored at the Museo Geominero, Madrid, Spain. The specimen was collected by Mr. Jose V. Casado from León, Spain.

Etymology: After Ana María Ordóñez, Mr. Casado's wife.

Type locality: La Magdalena, León, northern Spain.

Type horizon: Stephanian B.

Preservation: *O. anae* n. sp. is documented by an isolated right wing, most probably a metathoracic wing as indicated by the very narrow CuA+. At least the distal three quarters of the wing are rather completely preserved, except for (1) a small damage of the anterior margin close in front of the apex, (2) a small triangular penetration of the membrane by the fragments of two neuropteracean pinnules between RA+ and the anterior fan of MP- close distally to the fusion of MP- and RP-, and (3) the posteriormost border area close to the definite margin from the base to CuA+; in contrast, the base of the wing is completely destroyed until the region of the intercubital brace. ScA+ is not visible but might be probably indicated by a longitudinal fold close to the anterior margin.

Measurements (in mm): preserved length = 35.0; estimated total length = 38 (to max. 40); width (max.) = 16.4.

Description: Metathoracic wing of elongated oval shape; anterior margin distinctly convex, apex broadly rounded slightly shifted backwards; posterior margin not exactly visible, but – judging from the total morphology – most probably similarly convex as anterior one. ScP- subparallel to anterior margin, joining it at two thirds of the stimulated total length of the wing and thus comparatively short, subcostal area conspicuously narrow; RP+ distally with three pectinate anteriorly directed side branches forming a very narrow fan; stems of RA and RP basally adjacent, but not fused into R (symplesiomorphy), RP- subdivided into only three terminal branches close to the apex, forming also a very narrow triangular fan, the posterior branch joining the margin in front of the apex; MA+ not visible (fused with RP-); MP- proximally forked into two main branches; the anterior one (MP1+2) with a distinct, sigmoidally curved vein joined with RP- at 0.59 of the length of the wing, distally dichotomously forked into 6 terminal branches; the posterior

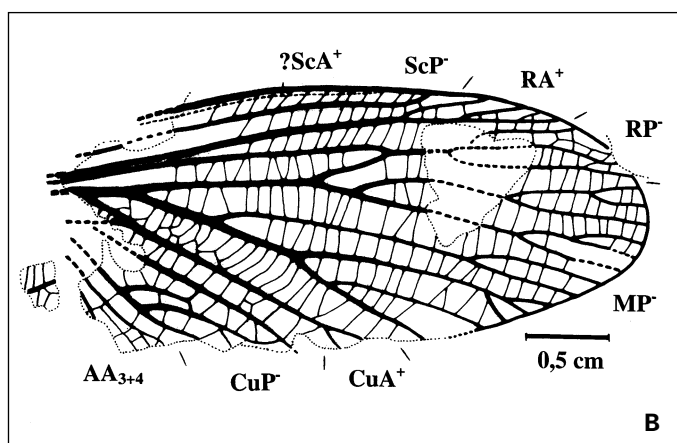
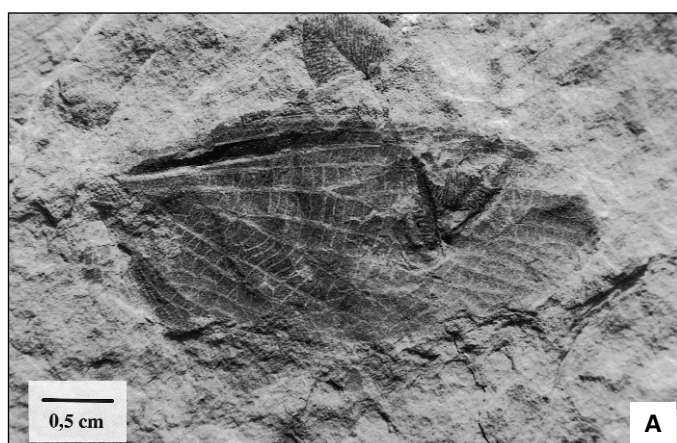


Fig. 1. *Omalia anae* n. sp. Holotype MGM-2330-H. Most probably a metathoracic wing; Late Carboniferous, Stephanian B; La Magdalena, León, northern Spain. A, Photograph. B, Camera lucida drawing.

Fig. 1. *Omalia anae* n. sp. Holotipo. MGM-2330-H. Probablemente un ala posterior. Carbonífero Superior, Estefaniense B; La Magdalena, León, Norte de España. A, Fotografía. B, Dibujo a la cámara clara.

one (MP3+4) subdivided much more proximally into long, distally bifurcate MP3 and dichotomously forked MP4 with 5 terminal branches; the whole medial area forming a very large, broad triangular fan covering nearly the total distal third of the length of the wing from a point in front of the apex to the precubital area; MP+CuA basally fused over a rather long distance (replacing the arculus of other hemipteroid stem-group families); CuA+ long, nearly straight, distally (very close to the anterior margin) probably bifurcate, otherwise simple; Cu proximally with distinct intracubital brace (forming a cell-like structure basally between MP+CuA, CuA+, CuP1+2 and CuP1; forks of CuP3+4 as well as anal forks directed distally, forming concave branches; cross veins mainly simple, rather regularly distributed, more dense and anastomosing only in the basal region.

Relations: The general venation (in particular the lack of a visible MA+, the evidently long fusion MP+CuA and the poorly branched RP- and CuA+) as well as the shape of the wing places it within the gerarid line of the hemipteroid stem-assembly (sensu Kukalová-Peck & Brauckmann, 1992) in particular within the Geraridae where it is similar to *Anthrakoris aetherius* Richardson, jr., 1956 from the Westphalian D of Mazon Creek, Illinois (U.S.A.) with which it shares the poorly branched RP- and similar shape and proportions, and to the type species of *Omalia*, *O. macroptera* van Beneden & Coemans, 1867 (distribution: see above), in particular in the sigmoidal connecting vein between RP- and MP-, and the long proximal fusion of MP- with CuA+.

But as far as it can be judged from the figures given by Richardson, jr. (1956) and by Carpenter (1992), *Anthrakoris* (documented by a mesothoracic wing) differs evidently by (1) the lack of a distinct sigmoidal connecting vein between RP- and MP-, (2) the much broader subcostal area, (3) the most probably unbranched RA+, (4) the straight to convex branches of CuP- and of the anal forks, and (5) the distinctly denser and more irregular cross veins. It cannot be excluded that the differences in the characters (2), (3) and (4) are caused by varies between mesothoracic and metathoracic wings.

More striking are the similarities to *Omalia* (see Brauckmann & Hahn, 1980 and Carpenter, 1992). Unfortunately, the hitherto known species of this genus are only represented by fragmentarily preserved isolated mesothoracic wings which render more difficult the detailed comparison. But to avoid an excessive splitting into less understood genera, we tentatively place the new, better preserved species, based most probably on a metathoracic wing, within

this genus where it seems to be kept best until a complete monographic revision of the whole genus shows a better way.

Relatively best preserved of the previously known taxa is the type species, *O. macroptera*, which mainly differs from *O. anae* n. sp. by the following characters: (1) the distinctly larger dimensions (width = 27.0 mm in contrast to 16.4 in *O. anae* n. sp.), (2) the obviously broader subcostal area, (3) the extremely narrower area of MP- with evidently less branches, (4) the convex branches of CuP- and of the anal forks, and (5) the denser and more irregular cross veins. Again, at least the differences in the characters (2) and (4) may be caused by varies between mesothoracic and metathoracic wings.

*Omalia carbonis* as well as *O. palmiformis* are represented by less completely preserved mesothoracic wings. As far as it is possible to judge only from the figures given in the previous literature, both are characterized by rather dense, more irregular cross-veins (nearly an archdictyon, as in the type species) as well as by a broad subcostal area. Additionally, *O. carbonis* is distinguished by a completely different connection of the venation complex of RP-, MP-, and CuA+. *O. palmiformis* is more similar, but differs by the less subdivided MP- and the more subdivided CuA+. Both poorly preserved species are in urgent need to be revised by the original material, as in earlier studies they have been globally included in *Omalia* without detailed comments. It is not undoubted that both species belong to different genera (as stated in the original publications and as treated at least for *O. palmiformis* by Carpenter, 1992), but then defined under modern conceptions.

*Cantabrala gandli* Kukalová-Peck & Brauckmann, 1992 is represented by a metathoracic wing from the Westfalian D (Cantabrian) of the Cantabrian Mountains – and therefore from a rather close type horizon and collecting area – and also belongs to the Geraridae. It shares with *Omalia anae* n. sp. the basally not fused RA and RP (symplesiomorphy), but can easily be distinguished by (1) its much more slender shape and smaller dimensions, (2) simple RA+, (3) large area of RP-, and (4) narrower area of MP-.

#### Acknowledgements

We are very grateful to the following persons: To Mr. Casado, the collector of the fossil, for making the specimen available to us for study, and to Professor Dr. Jarmila Kukalová-Peck (Ottawa) for most important help in the interpretation of the venation. C. B. also wishes to express his sincerest thanks to

Professor Dr. Concepción Álvarez Ramis (Madrid) and to Dr. Robert H. Wagner for helpful discussions on Spanish Carboniferous insects during joint field excursions on Carboniferous matters in Spain, Argentina and Germany as well as to Jarmila Kukalová-Peck for a marvellous stay in Ottawa in 1988 when we had the opportunity for numerous discussions on early hemipteroids.

## References

- Álvarez Ramis, C. 1990. Présence de restes de Blattidae dans le faisceau carrasconte du bassin Stéphaniens de Villablino (León, Espagne). *Bulletin Trimestriel de la Société d'Histoire Naturelle et des Amis de Muséum d'Autun*, 131, 7-10.
- Brauckmann, C. 1993. Notiz über Insekten-Reste aus dem Ober-Karbon in Spanien. *Jahresberichte des Naturwissenschaftlichen Vereins in Wuppertal*, 46, 115-119.
- Brauckmann, C. und Hahn, G. 1980. Ein neuer Insektenfund aus dem Westfalium von Ibbenbüren (Westdeutschland). *Paläontologische Zeitschrift*, 54(3/4), 301-312.
- Burnham, L. 1983. Studies on Upper Carboniferous insects: I. The Geraridae (Order Protorthoptera). *Psyche*, 90(1/2), 1-28.
- Carpenter, F. M. 1963. A megasecopteran from Upper Carboniferous strata in Spain. *Psyche*, 70(1), 44-49.
- Carpenter, F. M. 1992. Superclass Hexapoda. In: Kaesler, R. L. (ed.): *Treatise on invertebrate paleontology*, Part R, Arthropoda 4(3-4), 655 pp.
- Handlirsch, A. 1922. Insecta Palaeozoica. In: Diener, C. (ed.): *Fossilium Catalogus I: Animalia*, 16, 230 pp.
- Hennig, W. 1981. *Insect Phylogeny*. John Willey and Sons, 514 pp.
- Kukalová-Peck, J. and Brauckmann, C. 1992. Most Paleozoic Protorthoptera are ancestral hemipteroids: major wing braces as clues to a new phylogeny of Neoptera (Insecta). *Canadian Journal of Zoology*, 70, 2452-2473.
- Peñalver, E., Martínez-Delclòs, X. y Arillo, A. 1999. Yacimientos con insectos fósiles en España. *Revista Española de Paleontología*, 14(2), 231-245.
- Richardson, E.S. jr. 1956. Pennsylvanian invertebrates of the Mazon Creek area, Illinois. *Fieldiana Geology*, 12(1), 3-76.
- Schneider, J. 1983a. Die Blattodea (Insecta) des Paläozoikums. Teil 1: Systematik, Ökologie und Biostratigraphie. *Freiberger Forschungshefte*, C 382, 106-145.
- Schneider, J. 1983b. Taxonomie, Biostratigraphie und Palökologie der Blattodea-Fauna aus dem Stefan von Commeny (Frankreich) – Versuch einer Revision. *Freiberger Forschungshefte*, C 384, 77-100.

Recibido: Marzo 2001

Aceptado: Junio 2001