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Pennsylvanian (Carboniferous) biotas and palaeoenvironments
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The oldest insect from Romania: a new Carboniferous blattodean[2]

(Figs 1–3)

Abstract. The earliest insect from Romania is described and named *Phyloblatta resitensis* sp. nov. based on the discovery of a unique tegmen from the lower Stephanian of the old Secu colliery tip, Resita Basin, southwest Romania. It is a cockroachoid (blattodean) and the first Carboniferous insect to be recorded from the border area of east and southeast Europe; hopefully, it represents the start of a new entomofauna. The taxonomic challenge of interpreting cockroachoid wing venation is briefly discussed.

Key words: Insecta, Blattodea, *Phyloblatta* new species, Carboniferous, Romania.

INTRODUCTION

Upper Carboniferous (Pennsylvanian) insects are comparatively well known from Western Europe but are less often described from Eastern Europe. Thus there are large gaps in their recorded distribution sometimes on a national scale. The discovery of a blattodean (cockroachoid) in the South Carpathians is the first Carboniferous insect recorded from Romania and the earliest insect found in that country to date (only Cenozoic insects have been described previously – *vide* Protescu, 1938). This find fills a previous distribution gap in Eastern Europe between the Czech Republic and the Russian Federation. Romania also straddles the boundary between eastern and south-eastern Europe and no Carboniferous insect has yet been described from the latter. The find should therefore encourage further investigation in coalfields on a European regional as well as national scale.

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GEOLOGICAL SETTING

The cockroachoid was found on the old colliery tip [sterile mine dump] of the Secu mine, near Resita (locally spelt Reşiţa), Banat region, southwest Romania (Fig. 1). The Resita Basin is structurally part of the Alpine Getic Nappe (Popa, 2005a: 22). The tipped material has also yielded a rich Late Carboniferous flora and is a future Site of Special Scientific Interest (SSSI; *loc. cit.*: 44). The tip received

Fig. 1. Secu Colliery Tip, 2005

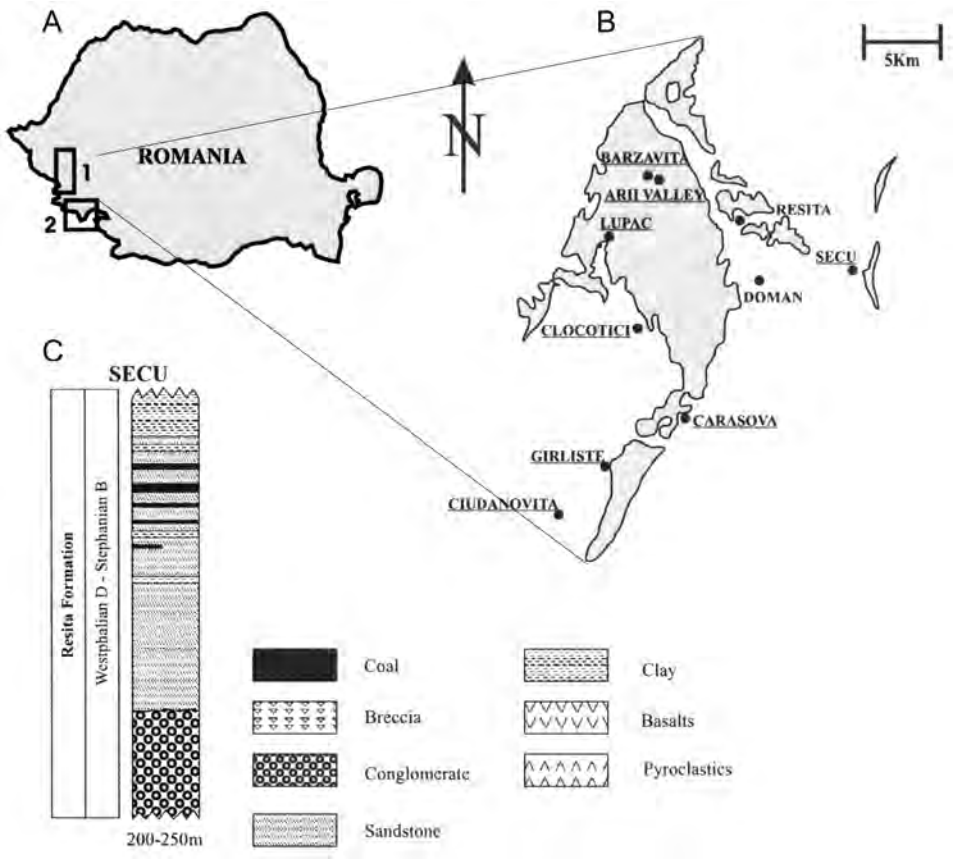

Fig. 2. **A** – Romanian Carboniferous basins in the South Carpathians: 1 – Resita Basin, 2 – Sirinia Basin; **B** – north Resita Basin; **C** – 1, 2 Secu section. After Popa (2005b)

Roof Shales from more than one coal seam in the intramontane Resita Formation prior to closure c. 1950, but, unfortunately, the mining records seem to be lost. Generally at Secu, the coal measures are considered to date from the Stephanian B; they overlie a locally outcropping basal conglomerate dated to the Asturian (*loc. cit.*: 26; Fig. 2). The abundance of pecopterids, however, coupled with rare lycophytes on the tip and the plant species list (*loc. cit.*: 52 *et seq.*) point to an earlier (Cantabrian?) date (Dr C. Cleal, pers. comm.). This is consistent with the association of a *Pecopteris* species (Dr M. Popa, pers. comm.; see below). The flora has been recently reviewed by Popa (2005b).

SYSTEMATICS

If species diversity is a measure of success, then insects are the most successful class of all time. Cockroaches (blattarians) are often cited as an ancient, Palaeozoic

order but the crown group (true cockroaches) only separated in the Late Mesozoic and the more ancient stem group (blattodeans) is therefore now referred to as roachoids (Grimaldi & Engel, 2005; cockroachoids in English). The Romanian find is a cockroachoid belonging to the extinct Phyloblattidae which is essentially a Late Palaeozoic family with six genera and about 200 species and subspecies (personal tally). Much of the lower taxonomy of cockroachoids is based on wing venation (especially of the forewings or tegmina) which is, however, prone to variation in living cockroaches; this has led to an artificial proliferation of binomia and even trinomia in fossils because pioneer palaeoentomologists were mostly typologists (e.g., Handlirsch, 1906-08). Schneider (1983a) erected the family but also started a taxonomic rationalisation programme with much synonymy which has already benefited blattodean biostratigraphy (e.g., Jarzembowski & Schneider, 2007). These considerations affect the naming of the isolated Romanian find (see below).

Class **Insecta** Linné, 1758
Order **Blattodea** Brunner, 1882
Family **Phyloblattidae** Schneider, 1983a
Genus *Phyloblatta* Handlirsch, 1906

Type species: *Blattina schroeteri* Giebel, 1867; Wettin Subformation, Siebigerode Formation; Loebejuen, Saale Basin, Germany; Stephanian C, Upper Pennsylvanian (Gzhelian)

Comment: A large genus, unfortunately with no subgenera, and some 190 nominal species (Bekker-Migdisova, 1991); essentially Upper Carboniferous (including 'Middle' where recognised) to Upper Permian with a cosmopolitan distribution (New Mexico–Urals) (Kukalová-Peck, 1991: 166) but also ranging into the Mesozoic; 110 valid species/subspecies are Upper Carboniferous of which at least 59 are Stephanian (Edna fossil insect database searched October, 2005).

For ease of taxonomic comparison, I have followed traditional venation nomenclature (with alternatives in parenthesis). Kukalová-Peck (1991) gave a more modern interpretation of venation homology in this genus. This is based on wing corrugation and alternation of convex (+) and concave (–) veins in dorsal aspect. Starting at the leading edge of the three-dimensionally preserved Secu wing (Fig. 3A), Sc (–) is readily correlated with her vein ScP, R is divided into RA (+) and RP (–) and the claval furrow (–) points to her CuP+AA1; the convexity of M is, however, anomalous and considered to be an artefact (see below).

Phyloblatta resitensis sp. nov.

Diagnosis: Species of *Phyloblatta* with arcuate veins Sc and RA; abbreviated RP and short tegmen; branches of M separating at a pronounced angle from the main stem; crossvein m-cu absent; and CuP curved.
Photograph, IGCP 469 Newsletter, www.museumwales.ac.uk/en/301.

Description: The species is known from a single left forewing (tegmen) with no counterpart. Wing with ovoid outline although tip and antero-basal part of costal

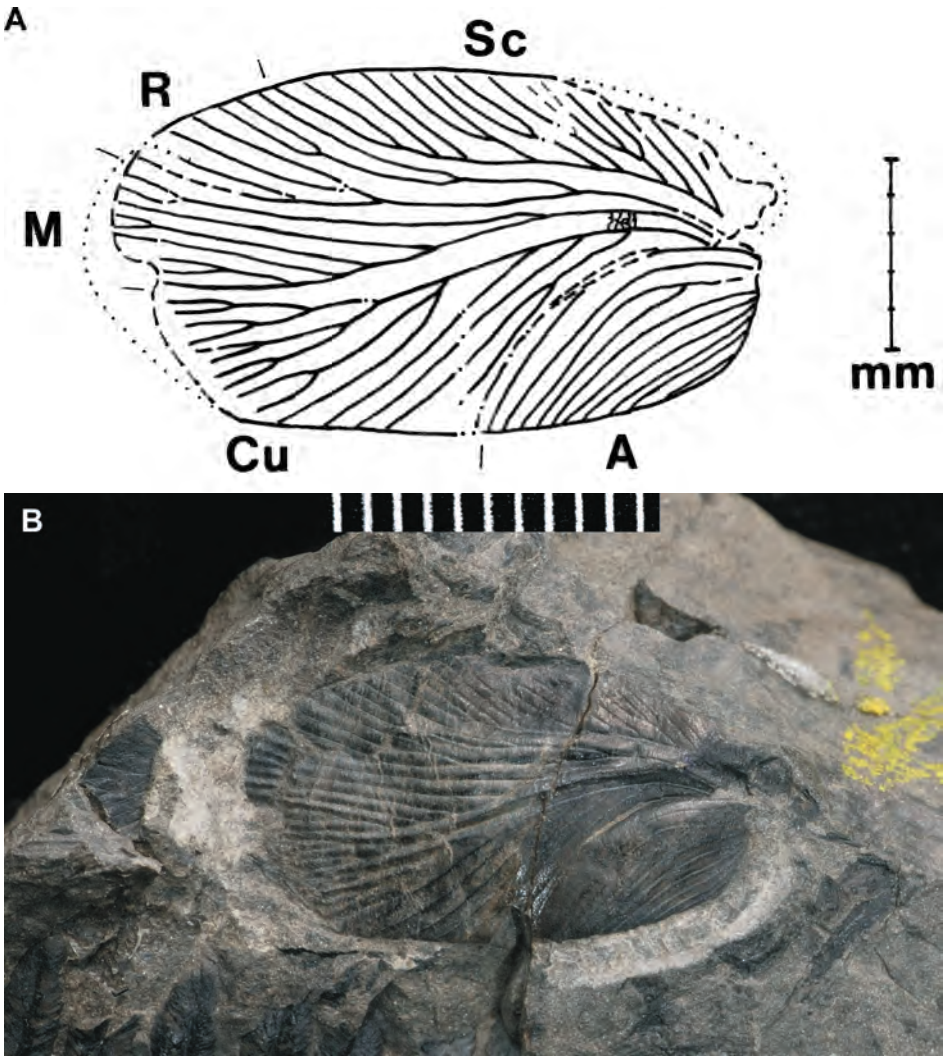

Fig. 3. **A** – *Phyloblatta resitensis* sp. nov. Venation diagram. Drawing conventions as in Jarzembowski (1980); **B** – photographs of tegmen. Scale in mm

area missing. Costal area 'strap' shaped; vein Sc distinctly sinuous with at least nine oblique branches (a couple of basal 'branches' (not shown) may be adhering plant matter). Branches of Sc with some dichotomous secondary branching and one tertiary branch. Sc terminates well beyond mid length of wing. R slightly sinuous with three branches to the antero-distal margin, the branches with some secondary and tertiary branching decreasing apically. M with five antero-apical branches and alternate end-twigging, the first branch distad of the separation of RA. CuA (Cu1) with arched stem and an apico-posterior fan of short dichotomous branches; also,

four long branches to the posterior wing margin with some secondary and tertiary branching. There is a prominent upfold between M and Cu which increases in amplitude basally. The fold runs obliquely so that it raises the base of M whereas the anterior branch of the cubital fan occupies a trough. The fold reverses the usual relief of M and CuA so that it may be an artefact (cf. Kukalová-Peck, 1991: fig. 6.19C). In any case, the cubital fan is probably due to vein capture of a posterior branch of M (*loc. cit.*).

The clavus is prominent, occupying over four-tenths of the preserved wing length, and is clearly defined by the claval furrow, but is slightly damaged (torn and folded) anteriorly. There are nine anal veins to the posterior margin, the third forked near the base.

The dense network of crossveins (archedictyon auct.) is striate-anastomosing.

Holotype: Palaeontology Laboratory, University of Bucharest, inventory no. P140/C2/73.

Preservation: 3-D carbonaceous impression in silty, slightly micaceous, grey mudstone with plant detritus including a pecopterid pinnule attributable to *Cyathocarpus* ex. group *cyatheus* (Brongniart) Mosbrugger (= '*Pecopteris*' *pectinata* sensu Corsin, 1951); the latter is a Late Asturian–Early Cantabrian variety or form of the longer-ranging species (Dr C. Cleal, pers. comm.).

Dimensions: Preserved length 17 mm, estimated complete length 18.5 mm; width 9.5 mm.

(Type) locality: Secu colliery tip, Resita Basin, South Carpathians, Romania.

Age: Lower Stephanian (see above).

Discussion: The fossil can be assigned to the Phyloblattidae because the forewing has a band-shaped costal area; R and M are approximately equally developed; CuA is long, sigmoidal and runs to the wing tip; CuP is simply arched; the dense network of crossveins is more or less anastomosing (Schneider, 1983a); the claval furrow is particularly distinct and strongly curved (Vršanský, Vishniakova & Rasnitsyn, 2002).

There is, however, a suggestion of dimorphism. The lack of wing elongation suggests that the specimen is a female (cf. Recent European Dusky Cockroach: Chinery, 1993: pl. 7, fig. 2b).

The fossil can be assigned to the large genus *Phyloblatta* because the tegmen is elliptical; Sc is half-two-thirds of the wing length; R occupies the anterior half of the wing and is not divided distinctly into R1 and Rs; CuA slopes gently with between 6 and12 branches and (projected) ends on the posterior margin close to the wing tip; the cubital area narrows distally and the anal area occupies a third of the wing length; the anal veins are parallel and not joined; the tegmen is between 11 and 35 mm long (Bekker-Migdisova, 1991).

No comparable blattodeans have been described previously from Romania nor bordering countries. Further afield in Eastern Europe, *Phyloblatta* has been described from the Czech Republic (Schneider, 1984), Germany (Handlirsch, 1906-08) and the Russian Federation (Bekker-Migdisova, 1961). I have compared

the venation of the Secu wing with these well-illustrated monographs plus other, smaller ones bringing the number of comparisons to over 121 comprising nearly two-thirds of *Phyloblatta* species and subspecies world-wide. Sc is more sinuous, longer and has more branches than the type species *Phyloblatta schroeteri* (Handlirsch, 1906-08: pl. XXI, fig. 23); it resembles, however, other *Phyloblatta* species, e.g., *Phyloblatta distincta* Martynov, 1933 (Bekker-Migdisova, 1961: fig. 49). Also, R is less evenly branched than in *P. schroeteri* and more like *Phyloblatta curvinervosa* Becker-Migdisova, 1961 (loc. cit.: fig. 51) although is probably shorter. M lacks the posterior vein capture of *P. schroeteri* but the dense network of crossveins is striate-anastomosing like the latter. CuA with posteriorly directed branches and a fan is found in several species of *Phyloblatta*, e.g., *Phyloblatta expulsata* Scudder, 1895 (Handlirsch, 1906-08: pl. XXXV, fig. 41) but the branching is particularly well developed in the Romanian species. The clavus is detached from *P. schroeteri* but in the Secu wing is similar to *Phyloblatta manebachensis* Goldenberg, 1869 except that the second anal vein and not the third is forked in the German species (Handlirsch, 1906-08: pl. XXXV, fig. 7). The Secu wing is short (length: width ratio circa 2 : 1) resembling *Phyloblatta solida* Schlechtendal, 1906 (*loc. cit*.: pl. XXIII, fig. 9). Comparison of characters with these Upper Carboniferous–Lower Permian species therefore suggests a mosaic pattern.

CONCLUSION

I have therefore referred the Secu wing to a new species, especially as it represents the start of a new entomofauna in eastern/southeastern Europe, pending phylogenetic analysis of blattodeans. Phyloblattids can, however, be variable like *Phyloblatta gaudryi* (Agnus, 1903) with which the Secu wing shares similarities in CuA and A (Schneider, 1983b: pl. II). Future work and further collecting might show that the distinctive Romanian morphotype actually represents a subspecies or even a 'form' of an established species (Jarzembowski, 2005). Alternatively, they may confirm the distinctiveness of the Romanian find. Either way, the nomenclature is kept simple. More importantly, a sustained search on the old colliery tips is needed for more animal fossils.

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