

Short communication

New Palaeontinidae (Insecta: Hemiptera) from the Lower Cretaceous of southern England

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ABSTRACT

Two new species of butterfly bug, *Valdicossus mikewebsteri* sp. nov. and *Ilerdocossus prowsei* sp. nov. are described from the Lower Cretaceous of southern England. *Valdicossus mikewebsteri* is the first complete hindwing of a palaeontinid from the UK. It is different from the type species in having a hindwing with a different colour pattern, vein Sc + R straight, and branch RA₂ slightly curved posteriorly then recurved; the length of vein RP + MP₁ is shorter than that of the type species and vein A₁ is short. *Ilerdocossus prowsei* sp. nov. is described based on a well-preserved forewing from the Lower Weald Clay (upper Hauterivian) of England; it is different from other species of the genus in possessing a narrower forewing and vein CuA bifurcating beyond the nodal line; the membrane is pitted distal of the nodal line.

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1. Introduction

Palaeontinidae (Insect: Hemiptera) is an extinct family of hemipterous insects from the Triassic (Carnian) to Cretaceous (Aptian) (Szwedo, 2018), and their fossils have been discovered in Europe, Central Asia, Russia, China, South Korea, Africa and South America (Shcherbakov and Popov, 2002; Menon et al., 2005; Chen et al., 2016; Nam et al., 2017). The first palaeontinid was described from the Middle Jurassic of England and mistaken for a lepidopteran (Butler, 1873; Tillyard, 1921). So far, Cretaceous palaeontinids, belonging to more than 30 species in 12 genera, have been discovered in Spain, Russia, China, England and Brazil (Handlirsch, 1906; Martynov, 1926; Gómez-Pallerola, 1984; Whalley and Jarzembowski, 1985; Shcherbakov, 1988; Ren, 1995, 1998; Ueda,

1996, 2008; Martins-Neto, 1998; Menon and Heads, 2005; Menon et al., 2005; Wang et al., 2008a).

The early Cretaceous palaeontinids from Europe are mainly reported from Spain and England. The Lithographic Limestone of Montsech, Lérida province, Spain is a facies development of the Caliza con Caraças Formation (Garrido-Megias and Rios Aragües, 1972) and was deposited in a lagoonal-lacustrine environment which became stagnant at times (Schairer and Janicke, 1970). The Spanish palaeontinids from the Lithographic Limestone are as follows: *Pachepsyche vidali* Meunier, 1902; *Montsecocossus sererai* Gómez-Pallerola, 1984; *Ilerdocossus villaltai* Gómez-Pallerola, 1984; *Wonnacottella pulcherrima* Whalley and Jarzembowski, 1985 (Meunier, 1902; Gómez-Pallerola, 1984; Whalley and Jarzembowski, 1985). The Wealden Supergroup of southern England has yielded a unique and abundant Early Cretaceous insect fauna (Jarzembowski, 1995), but palaeontinids are uncommon. The first Wealden palaeontinid, a forewing, was reported from the Lower Weald Clay Formation which was probably attributable to the genus *Ilerdocossus* Gómez-Pallerola, 1984 (Jarzembowski, 1984). A second Wealden palaeontinid, *Valdicossus chesteri*, was described on the basis of a well-preserved hindwing which was the first hindwing of Palaeontinidae from the UK (Wang

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et al., 2008a). Here we describe two new species from two different localities: *Valdicossus mikewebsteri* sp. nov. is from a new palaeontinid locality, Smokejacks brickworks in southern England, and is the first complete hindwing of Palaeontinidae from the UK. *Ilerdocossus prowsei* sp. nov. is based on a well-preserved forewing from the former Clock House Brickworks, also in southern England.

2. Material and methods

The material was found by Mike Webster and one of us (EAJ) in the county of Surrey, southern England (Fig. 1), and is deposited in the Natural History Museum (London) and Booth Museum of Natural History (Brighton) respectively. The specimens were prepared by EAJ with a Burgess vibrotol under a Soviet MBS-1 binocular microscope.

The wing venation nomenclature of Palaeontinidae used in this paper is based on the interpretations by Wang B. et al. (2009) and Nel et al. (2012). The line drawings were readjusted on photographs using image-editing software (Coreldraw 2017 and Adobe Photoshop CS). In the drawings, dashed lines denote the nodal line in the forewing, and grey solid lines indicate faint and extrapolated veins.

3. Systematic palaeontology

Order: Hemiptera Linnaeus, 1758

Infraorder: Cicadomorpha Evans, 1946

Superfamily: Palaeontinoidea Handlirsch, 1906

Family: Palaeontinidae Handlirsch, 1906

Genus *Valdicossus* Wang, Zhang, and Jarzembowski, 2008

Type species: *Valdicossus chesteri* Wang, Zhang, and Jarzembowski, 2008; by original designation and monotypy.

Type horizon and locality. Lower Weald Clay (lower Hauterivian), Cooden, East Sussex, southern England.

Species included. Two species, *Valdicossus chesteri* Wang, Zhang and Jarzembowski, 2008 and *V. mikewebsteri* sp. nov., both from the Lower Cretaceous of England.

Genus *Valdicossus* Wang, Zhang, and Jarzembowski, 2008

***Valdicossus mikewebsteri* sp. nov.**

Fig. 2A-C

Etymology. After Mike Webster, fossil finder.

Holotype. NHMUK II S4046a, b, part and counterpart; hind wing. Deposited in The Natural History Museum, London; Upper Weald Clay Formation, below BGS bed 5c, Lower Cretaceous (lower Barremian), Smokejacks brickworks, Surrey, England.

Diagnosis. Costal area wide and more than half length of wing. RA_1 and RA_2 arising from RA_{1+2} at same level of indentation; branch RA_2 slightly curved posteriorly then recurved. Vein MP_{3+4} unbranched and slightly curved; vein CuP slightly curved anteriorly; vein Pcu curved posteriorly; A_1 short; membrane with spotty colour pattern.

Description. Hindwing oval, with length 16.8 mm long; width 12 mm wide. Costal margin with distinct indentation. Anterior margin curved in distal part. Costal area wide and more than half length of the wing, length/width ratio 2.9, maximal width in basal 1/4th. Vein R fused with vein Sc basally and branching into veins Sc + RA and RP. Branch Sc separating from vein Sc + RA and ending in costal margin just basad of wing indentation. RA_1 and RA_2 arising from RA_{1+2} opposite indentation, RA_1 ending in costal margin just distad of indentation. Branch RA_2 slightly curved posteriorly then recurved, ending on margin. Vein RP branching from stem R at 0.2 of wing length, then fusing with vein MP_1 for a long distance basad of indentation and finally bifurcating a little basad of wing indentation. Vein RP + MP_1 length 2.4 mm, veins MP_1 , MP_2 and MP_{3+4} arising from stem MP at wing base; branch MP_1 almost straight; branch MP_2 slightly curved anteriorly; vein MP_{3+4} unbranched and slightly curved; stem CuA forking into veins CuA_1 and CuA_2 basad of indentation; branches CuA_1 and CuA_2 long, branch CuA_2 slightly curved. Vein CuP slightly curved anteriorly. Vein Pcu curved posteriorly. Vein A_1 short. Wing membrane infusate with three transverse light fasciae.

Genus *Ilerdocossus* Gómez-Pallerola, 1984

Type species: *Ilerdocossus villaltai* Gómez-Pallerola, 1984; by original designation.

Species included. Nine species, *I. villaltai* and *I. pulcherrima* (Whalley and Jarzembowski, 1985), *I. hui* (Ren et al., 1998), *I. beipiaoensis* (Ren et al., 1998) and *I. exiguus* (Ren et al., 1998), *I. fengningensis* (Ren



Fig. 1. Map showing the location of insect fossil localities. S: Smokejacks brickworks; C: Clockhouse brickworks.

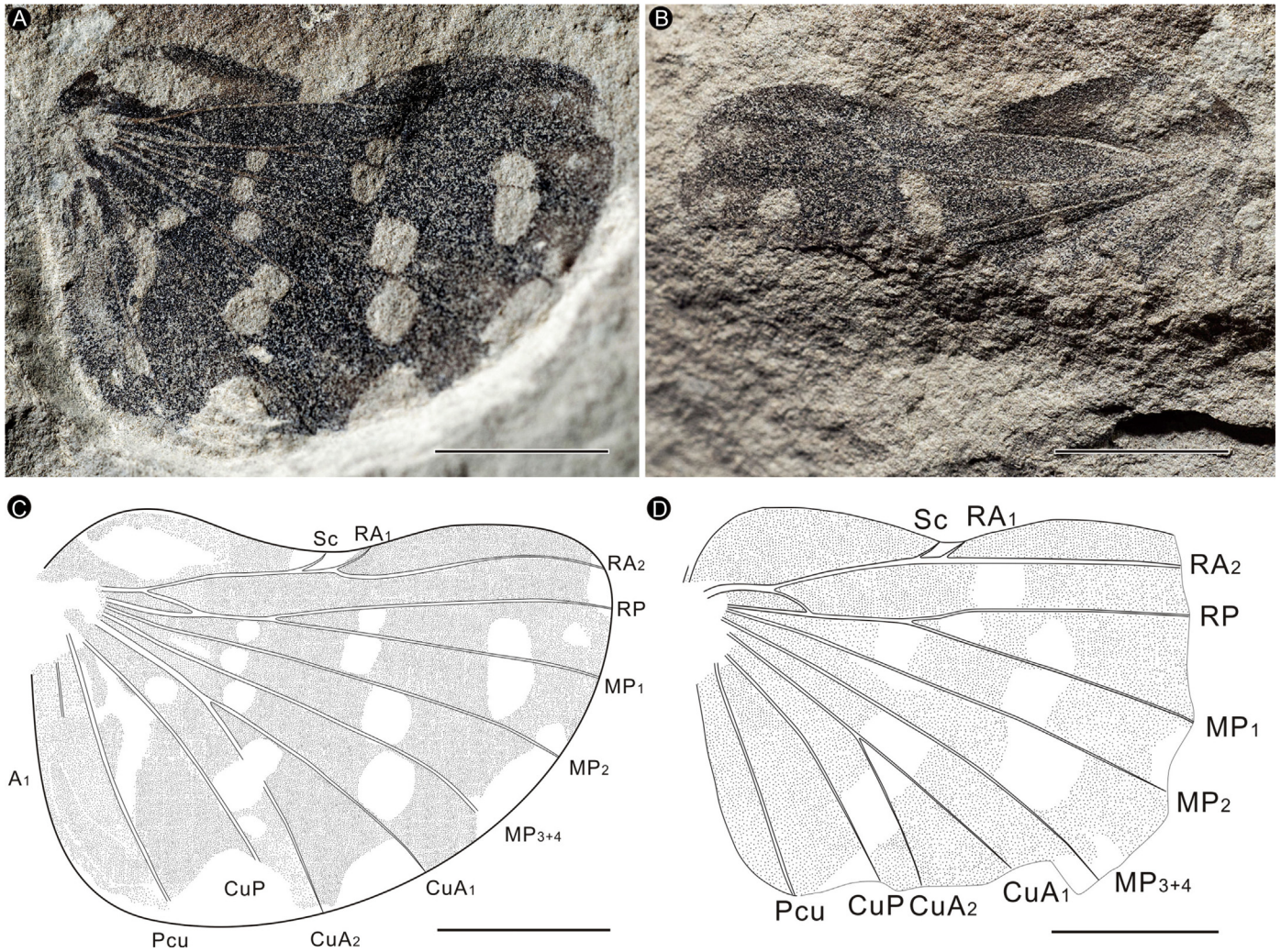


Fig. 2. A–C, *Valdicossus mikewebsteri* sp. nov. A, Holotype NHMUK II S4046a, part; B, counterpart of holotype NHMUK II S4046b. C, line drawing of holotype. D, *Valdicossus chesteri* Wang et al., 2008, hindwing redrawn from Wang et al. (2008a). Scale bars represent 5 mm.

et al., 1998), *I. pingquanensis* (Ren et al., 1998), and *I. ningchengensis* (Wang et al., 2008b), and new species *I. prowsei* sp. nov..

Genus *Ilerdocossus* Gómez-Pallerola, 1984

Ilerdocossus prowsei sp. nov.

Fig. 3A–C

Etymology. After Alan Prowse, fossil collector.

Holotype. BMB 014927, 018805; forewing; Lower Weald Clay Formation beneath BGS bed 3/3a, Lower Cretaceous (upper Hauterivian); Clockhouse brickworks, near Capel, Surrey, England, UK.

Diagnosis. Forewing narrow, large size; vein Cu divided into CuA and CuP at same point where vein CuA meets crossvein $r + m\text{-}cua$; crossvein $m_4\text{-}cua$ long and slightly curved; discal cell about one-third of wing length; stem MP dividing into MP_{1+2} and MP_{3+4} before nodal line; vein MP_{1+2} bifurcating distad of indentation; vein MP_{3+4} bifurcating basad of indentation; branch CuA_1 strongly curved anteriorly, branch CuA_2 curved posteriorly then recurved; clavus absent. Membrane pitted distad of nodal line.

Description. Forewing triangular, with length 59 mm, width 25 mm. Costal margin slightly curved anteriorly. Nodal indentation distinct, at about basal 0.42 of wing length. Vein Sc arising basally, fused with stem R + MP at basal 0.17 of wing length. Stem R + MP curved, connected to branch CuA by crossvein $r + mp\text{-}cua$

at same point where stem Cu branches into veins CuA and CuP. Crossvein $r + mp\text{-}cua$ long and oblique. Branches RA, RP and M departing from stem R + MP at same point. Branch RA slightly curved anteriorly. Branch RP connected to branch MP_1 by crossvein $r\text{-}mp_1$ distad of indentation. Stem M dividing into MP_{1+2} and MP_{3+4} before nodal line. Branch MP_{1+2} branching into veins MP_1 and MP_2 distad of indentation. Branch MP_{3+4} branching into MP_3 and MP_4 at basal 0.36 of wing length. Branch MP_1 partly directed anteriorly, geniculate at junction with crossvein $r\text{-}mp_1$. Branch MP_3 almost straight then curved anteriorly near margin. Crossvein $mp_4\text{-}cua$ long, oblique and slightly curved. Stem Cu branching into veins CuA and CuP at basal 0.09 of wing length. Branch CuA slightly curved posteriorly between crossveins $r + mp\text{-}cua$ and $mp_4\text{-}cua$, branching into veins CuA_1 and CuA_2 after crossvein $mp_4\text{-}cua$, basad of nodal indentation. Branches CuA_1 and CuA_2 long; branch CuA_1 strongly curved anteriorly, branch CuA_2 curved posteriorly then recurved. Discal cell length 19 mm, width 8.5 mm at nodal line, about one-third of wing length; antenodal region trapezoidal, postnodal region less than half of antenodal region in length. Nodal line traceable as a crease across RA and RP to MP_{1+2} , M_{3+4} and then separating discal cell into two parts; it continues crossing CuA just before its initial division, clavus absent. Membrane pitted distad of nodal line.

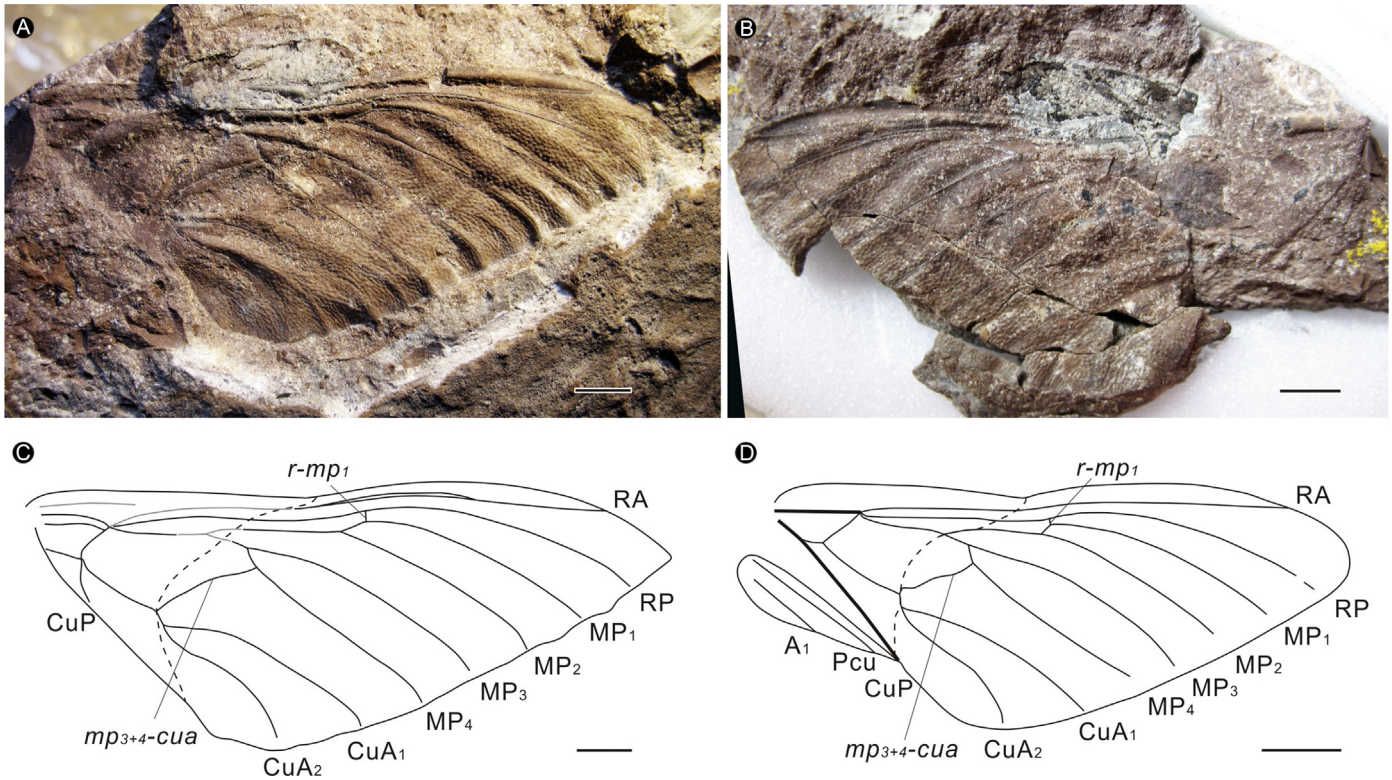


Fig. 3. A–C, *Ilerdocossus prowsei* sp. nov. A, Holotype BMB 014927 (CHA5), part; B, counterpart of holotype BMB 018805. C, line drawing of holotype. D, *Wonnacottella pulcherrimma* Whalley and Jarzembowski, 1985, hindwing redrawn from Whalley and Jarzembowski (1985). Scale bars represent 5 mm.

4. Discussion

Valdicossus Wang et al., 2008a, 2008b was erected based on a well-preserved but incomplete hindwing from the Lower Cretaceous Wealden Supergroup of southern England (Wang et al., 2008a). *Valdicossus mikewebsteri* sp. nov. was placed in the genus *Valdicossus* based on the following features: hindwing oval, anterior margin curved in distal part; costal area wide; vein R fused with vein Sc basally, and branching into veins Sc + RA and RP; vein Sc terminating in costal margin just basad of wing indentation; branch RP fused with vein MP₁ for a long distance basad of level of indentation; veins MP₁, MP₂ and MP₃₊₄ arising from stem MP at wing base; vein MP₃₊₄ unbranched. The new species and the type species are from different locations and horizons; it differs from the latter in the hindwing having a different colour pattern; vein Sc + R straight; branch RA₂ slightly curved posteriorly then recurved; vein RP bifurcating from vein RP + MP₁ basad of vein Sc separating from vein Sc + RA, and the length of vein RP + MP₁ is shorter than that of the type species; vein A₁ is also short. They both have the following characters: anterior margin curved in the distal part; vein R fused with vein Sc basally and branching into veins Sc + RA and RP; veins MP₁, MP₂ and MP₃₊₄ arising from stem MP at the wing base; vein MP₃₊₄ is unbranched and vein RP fused with vein MP₁ for a long distance basad of the indentation.

Ilerdocossus Gómez-Pallerola, 1984 was erected based on a forewing from the Lower Cretaceous of Lérida, Spain. Menon et al. (2005) considered both *Wonnacottella* and *Liaocossus* to be the junior synonyms of *Ilerdocossus*. Wang B. et al. (2008b) also considered three genera (*Ilerdocossus*, *Wonnacottella*, and *Liaocossus*) as belonging to the same genus and our material also provides further support this view.

We placed *Ilerdocossus prowsei* sp. nov. in the genus *Ilerdocossus* based on the following features: forewing triangular, with narrow costal area; reduced clavus; nodal indentation distinct; RA, RP and

MP separate at the same point; discal cell long; antenodal region trapezoid. It mostly resembles *Wonnacottella pulcherrimma* (Fig. 3D) (Whalley and Jarzembowski, 1985) from Spain: they both have a narrow forewing with a similar venation, and vein MP₁₊₂ bifurcating distad of the indentation; vein MP₃₊₄ bifurcates basad of the indentation, branch CuA₂ is curved posteriorly then recurved; and the membrane is pitted distal of the nodal line. But the former differs from the latter in having a much larger and more narrow forewing, vein Sc arising basally, fused with stem R + MP at basal 0.17 of wing length; vein Cu divides into CuA and CuP at the same point where vein CuA meets crossvein r + mp-cua; stem M divides into MP₁₊₂ and MP₃₊₄ before the nodal line, vein CuA bifurcates beyond the line, cross vein r-mp₁ is long. It is also distinctly different from other species of *Ilerdocossus* in having a forewing with membrane pitted distal of the nodal line, and vein CuA bifurcating beyond the nodal line.

5. Conclusions

Based on two well-preserved fossils from England, the new species *Valdicossus mikewebsteri* sp. nov. and *Ilerdocossus prowsei* sp. nov. are proposed. Our new material further confirms that *Ilerdocossus* was probably widely distributed in Eurasia and was diverse in the Early Cretaceous whereas *Valdicossus* appears to be a Wealden endemic.

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