Brief report

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First record of the fossil dragonfly family Eumorbaeschnidae from the Upper Jurassic of Poland

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The fossil dragonfly *Eumorbaeschna adriankini* sp. nov. is decribed as first fossil insect from the Upper Jurassic of Central Poland (Owadów-Brzezinki quarry, Tomaszów Mazowiecki area), and as first record of the family Eumorbaeschnidae (Odonata, Anisoptera, Aeshnoptera) outside the Solnhofen lithographic limestone.

Introduction

The genus *Eumorbaeschna* was erected by Bechly et al. (2001) to solve a genuine taxonomic mess, which was created by a several publications with misidentified specimens and incorrect attributions (e.g., Needham 1907 and Carpenter 1932). Previously, the same taxon was generally known under the incorrect scientific name "*Morbaeschna muensteri*". The first valid description of this species was provided by Carpenter (1932), who incorrectly attributed it to the genus *Cymatophlebia*.

Eumorbaeschna jurassica (Carpenter, 1932) was previously the only known species of the Mesozoic stemgroup aeshnid family Eumorbaeschnidae (Bechly et al. 2001). All 18 known specimens had been found in the Upper Jurassic Solnhofen limestone of Bavaria. We here describe the first discovery of a new species of the genus *Eumorbaeschna* from the Upper Jurassic of Central Poland.

Institutional abbreviations.—MGFA, Museum of the Association of Friends of Geosciences "Phacops" in Łódź, Poland; SMNS, Staatliches Museum für Naturkunde Stuttgart, Germany; ZPAL, Institute of Paleobiology of the Polish Academy of Sciences, Warszawa, Poland.

Other abbreviations.—CuA, cubitus anterior; IR, interradius; MA, media anterior; Mspl, median supplement; pseudo-IR1, pseudo-interradius 1; RP, radius posterior; Rspl, radial supplement.

Geology, stratigraphy, and taphonomy

The type locality is the working quarry Owadów-Brzezinki that is located in the vicinity of Tomaszów Mazowiecki in Central Poland (Fig. 1A). The exposed Upper Jurassic carbonate sedimentary sequence of the Kcynia Formation can be divided into three sucessive units i.e., I, II, and III (= A, B, and C units of Zielińska 2003; compare Salomon et al. 2007; Fig. 1B). More precisely, the carbonates belong to the Middle Volgian (= Upper Tithonian) *Zaraiskites scythicus* Zone, *Zaraiskites zarajskensis* Subzone, uppermost part of the *Zaraiskites regularis* Horizon through almost the entire *Zaraiskites zarajskensis* Horizon (Fig. 1B). The lowermost unit I comprises, initially, yellowish thin-bedded marly limestone beds. The yellowish marly limestone (recently obscured) passes gradually upwards into massive fine-grained limestone (~6.6 of total thickness), with indistinctive lamination, forming a few beds of 40–80 cm thickness (Fig. 1B). The overlying unit (II) is represented by thin-bedded, fine-grained limestone with occasional distinctive parallel lamination and mass occurrence of polychaete tubes in a thin horizon (Fig. 1B). The uppermost unit (III) is highly fossiliferous and has a horizon of finely bedded fine-grained limestone at its base (= *Corbulomima obscura* horizon), dominated by small opportunistic bivalve *Corbulomima obscura*. Other fossils are significantly rare and represented by perfectly preserved moulds of mollusks, arthropods (including the first insect, *Eumorbaeschna adriankini* sp. nov., described herein), and well preserved teeth and bones of different vertebrates (Kin and Błażejowski 2012; Kin et al. 2012) Taphonomical evidence from the macrofossil assemblage of the fossiliferous *Corbulomima obscura* horizon indicates that the unit should be classified as a Konzentrat-Lagerstätte sensu Seilacher (1970). However, rare finding of almost completely preserved organisms (e.g., limulid and fish) within the fossiliferous *Corbulomima obscura* horizon suggests, that this horizon locally could also represent a transitional facies between a Konzentrat- and Konservat-Lagerstätte (Kin et al. 2013). The *Corbulomima obscura* horizon passes upwards into thin- to medium-bedded limestone with very rare corbulid bivalves, and almost no other macrofossils. These limestone beds can be divided into: (i) a lowermost thin bedded fine-grained limestone; (ii) a median, 80 cm thick, synsedimentary intraclastic breccia (Fig. 1B); and (iii) an uppermost unit of thin bedded, fine-grained limestone.

In general, the sedimentary and palaeontological evidence from units I, II, and III documents a change from an offshore to nearshore, perhaps lagoonal, setting (Kin et al. 2012, 2013).

Material and methods

The drawing was made with a camera lucida on a Wild M5 stereo microscope, and the fossil was photographed with a Sony HX100V digital camera with Marumi +3 achromat macro lens.

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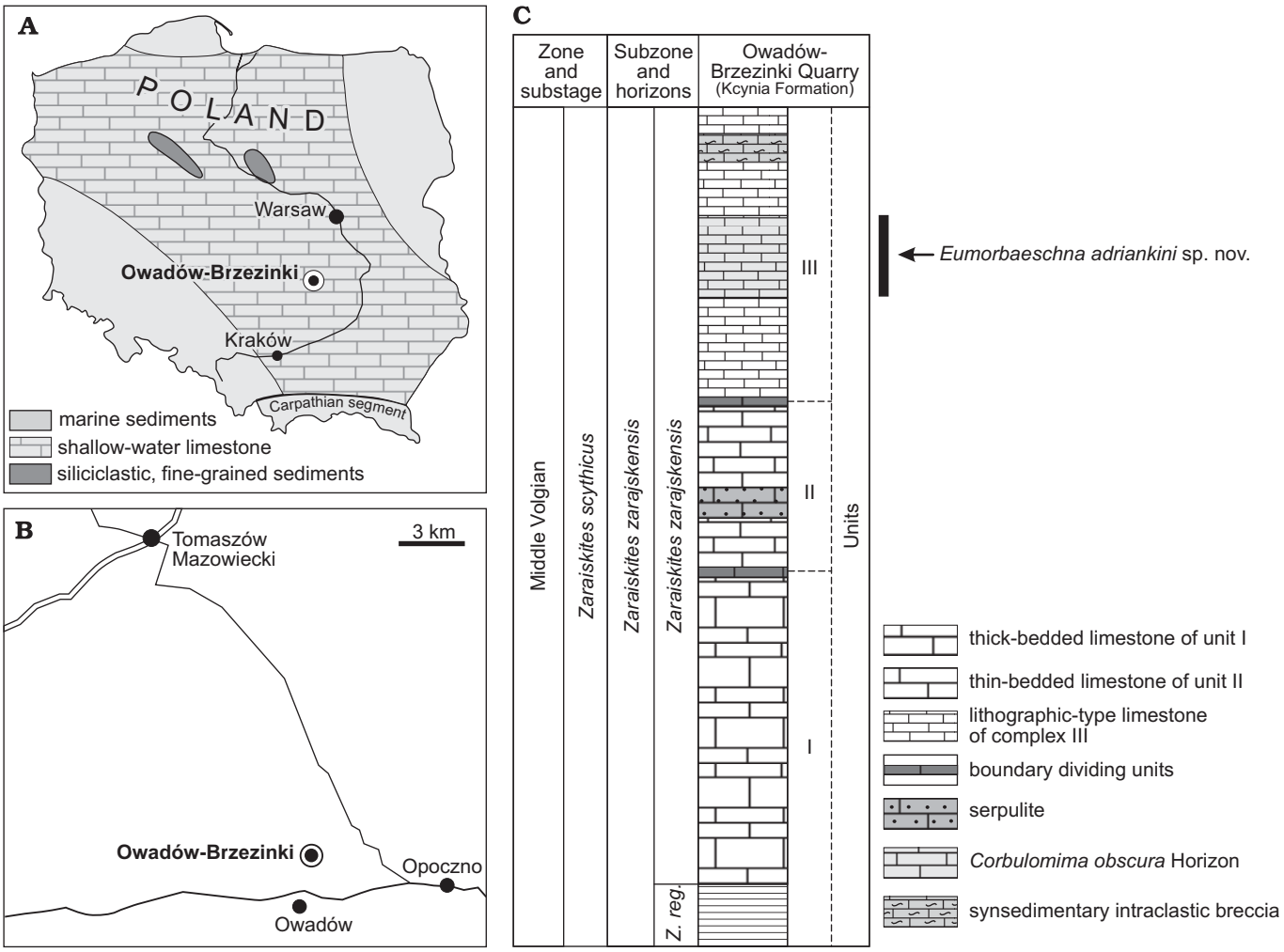

Fig. 1. **A**. Middle Volgian (= Upper Tithonian) palaeofacial map of Poland (after Gaździcka, 1998, slightly modified). **B**. Road map of Tomaszów Mazowiecki area showing location of Owadów-Brzezinki quarry. **B**. Stratigraphical position of the sedimentary sequence cropped out in the quarry at Owadów-Brzezinki showing the successive sedimentary units I–III of the Middle Volgian (= Upper Tithonian) strata. *Z. reg.*, *Zaraiskites regularis*.

The figure has been subsequently edited and polished with the Adobe Photoshop CS3 imaging software.

The terminology of odonate wing venation is based on Riek and Kukalová-Peck (1984), as modified by Nel et al. (1993) and Bechly (1996). The used phylogenetic classification of the order Odonata is mainly based on Bechly (1996, 2003) and Bechly et al. (2001).

Systematic palaeontology

Order Odonata Fabricius, 1793

Suborder Anisoptera Selys, 1854

Family Eumorbaeschnidae Bechly, Nel, Martínez-Delclòs, Jarzembowski, Coram, Martill, Fleck, Escuillié, Wisshak, and Maisch, 2001

Genus *Eumorbaeschna* Bechly, Nel, Martínez-Delclòs, Jarzembowski, Coram, Martill, Fleck, Escuillié, Wisshak, and Maisch, 2001

Type species: *Eumorbaeschna jurassica* (Carpenter, 1932); Germany, Solnhofen lithographic limestone, Lower Tithonian, Upper Jurassic.

Eumorbaeschna adriankini sp. nov.

Fig. 2.

Etymology: The originally projected species name was changed by the first author in honour of the co-author Dr. Adrian Kin, a dedicated young palaeontologist, who tragically deceased on June 26th 2012, shortly before the manuscript had been accepted for publication.

Holotype: Specimen no. ZPAL J1/O-B1 (old no. MGFA/O-B/OD-1).

Type locality: Owadów-Brzezinki quarry of Nordkalk GmbH, Sławno, Central Poland (Fig. 1A).

Type horizon: Upper Jurassic, Middle Volgian, Late Tithonian, *Zaraiskites scythicus* Zone, *Zaraiskites zarajskensis* Subzone, *Corbulomima obscura* horizon.

Diagnosis.—Distinctly smaller than the type species (distance between nodus and stigma only 11 mm, instead of 14–15 mm), only of 75% the size; lower number of only 7–8 postnodal and postsubnodal crossveins (instead of 10–12 in the type species); pterostigma more elongate and slender (ratio of length to width

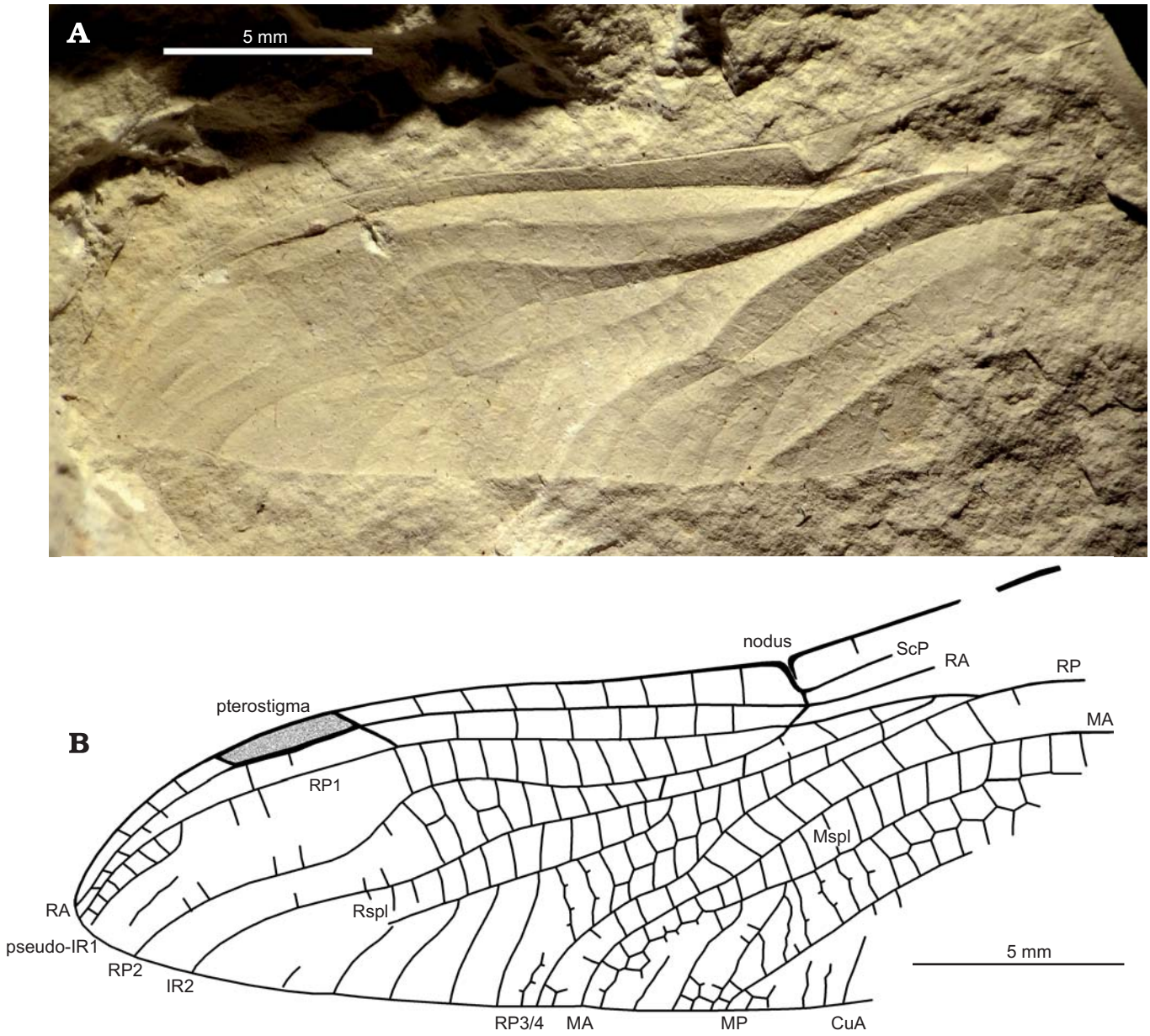

Fig. 2. Dragonfly *Eumorbaeschna adriankini* sp. nov., holotype ZPAL J1/O-B1; Upper Tithonian, Owadów-Brzezinki quarry, Poland. Forewing in ventral view (**A**) and explanatory drawing (**B**). Abbreviations: CuA, cubitus anterior; IR, interrradius; MA, media anterior; MP, media posterior; Mspl, median supplement; RA, radius anterior; RP, radius posterior; Rspl, radial supplement; ScP, subcosta posterior.

is 4.9, instead of Ø 4.0 in the type species); pseudo-IR1 originates distinctly distal of pterostigma.

Description.—Distal part of an isolated forewing. Length from nodus to apex 18.0 mm (estimated total wing length about 31 mm), maximum width 8.9 mm; distance from nodus to pterostigma 11.1 mm; 8 postnodal and 7 postsubnodal crossveins between nodus and stigma; pterostigma elongate (3.28 mm long and 0.66 mm wide) without thickened posterior margin; stigma distinctly braced; pseudo-IR1 originates distal of stigma; only one row of cells between RP1 and pseudo-IR1; RP2 originates subnodus; two lestine oblique veins between RP2 and IR2, 1.5 and 3.5 cells distal of subnodus; basal half of RP2 closely parallel to RP1 with a single row of cells inbetween till the stigmal brace; RP2 strongly undulate and IR2 somewhat undulate, with widened area between the middle parts; Rspl straight and parallel to IR2 with a single row of cells inbetween; RP3/4 and MA parallel and undulate; Mspl straight and parallel to MA with a single row of cells inbetween; posttrigonal space with three rows of cells; CuA ends distal of nodus.

Discussion.—The shape of the wing and the median-cubital area clearly show that this fossil represents the distal half of a right forewing, preserved in ventral aspect (reversed corrugation of main veins).

Wing venation and dimensions of the preserved part of this fossil dragonfly forewing are very similar to the corresponding part in the other known specimens of *Eumorbaeschna jurassica*

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(compare Bechly et al. 2001). Important diagnostic similarities are the narrow posttrigonal area, the presence of two straight supplement veins Rspl and Mspl with only a single row of cells behind them, the undulate veins MA, RP3/4, IR2, and RP2, the widened area between IP2 and RP2, two lestine oblique veins, and an elongate and strongly braced pterostigma. Consequently, the attribution to the genus *Eumorbaeschna* is well established. The diagnostic differences are subtle, but nevertheless sufficient to warrant the status as a distinct new species.

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Adrian Kin passed away on June 26th, 2012.

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