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The Jurassic orthopteran *Allaboilus gigantus* Ren and Meng, 2006 (Prophalangopsidae) from Beipiao, Northeast China and its biostratigraphical significance

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ABSTRACT

The orthopteran *Allaboilus gigantus* Ren and Meng, 2006 (Prophalangopsidae) is reported based on a male forewing from the Middle-Upper Jurassic Haifanggou Formation of Beipiao, western Liaoning, China. This discovery greatly extends the distribution of the species from Daohugou in Inner Mongolia eastwards to Beipiao in western Liaoning. It further provides new evidence for correlation of the Daohugou Beds with the Haifanggou Formation indicating a Callovian-early Oxfordian age for the Daohugou Beds.

1. Introduction

Prophalangopsidae as the youngest family of the superfamily Hagloidea (Insecta, Orthoptera) can be dated back to the Early Jurassic (Gorochov, 2003; Wang, 2016). And Aboilinae is the most diverse subfamily of Prophalangopsidae including 68 described species within 27 genera from the Lower Jurassic-Lower Cretaceous of Kazakhstan, China, Russia, Mongolia, Japan, New Zealand, England and Germany (Wang, 2016). Especially in northeastern China, lots of insects assigned to this subfamily have been reported from the Jurassic Yanliao Biota and the Cretaceous Jehol Biota (Zhang et al., 2015; Wang, 2016). In western Liaoning Province, northeastern China the fossil-rich Haifanggou Formation yields lots of fossils including bivalves, clam shrimps, insects and plants (Chen, 2003; Wang et al., 2007; Wang, 2010; Wang and Wang, 2010) which belong to the Yanliao Biota. However, very few prophalangopsids have been recorded from this formation. Here, we report a new specimen assigned to *Allaboilus gigantus* Ren and Meng, 2006 within Aboilinae from the Jurassic Haifanggou Formation, and further discuss its biostratigraphical significance.

2. Geological background

The specimen described herein was collected from the Haifanggou Formation in Haifenggou Village, Beipiao City, western Lioning Province, China (Fig. 1A–C). The Haifanggou Formation underlies the Upper Jurassic Lanqi Formation (=Tiaojishan Formation) and overlies the Lower Jurassic Beipiao Formation (Hong, 1983; Zhang et al., 2015). Its lower part consists of sandstone, conglomerate, shale and interbedded pyroclastic rocks, and its upper part of breccia, conglomerate and sandstone (Fig. 1D). The lower Haifanggou Formation contains more conglomerate and the proportion of pyroclastic rocks increases upward (Chang et al., 2014). The formation yields rich fossils dominated by the clam shrimp *Triglypta haifanggouensis*, bivalves *Ferganoconcha* spp., insects *Furvoneta relicta* and *Yanliaocorixa chinensis*, and also including abundant plants such as *Schmeissneria* and *Xingxueanthus* (Chen, 2003; Wang et al., 2007; Zhang and Kluge, 2007; Wang, 2010; Wang and Wang, 2010; Zhang, 2010; Zhang et al., 2015; Liao et al., 2017). High-precision $^{40}Ar/^{39}Ar$ age studies indicate that the lowest part of the Lanqi Formation is 161.8 ± 0.4 Ma and the middle Haifanggou Formation is 166.7 ± 1.0 Ma (Chang et al., 2009, 2014). In other words, the Haifanggou Formation is Callovian-early Oxfordian in age (Cohen et al., 2013).

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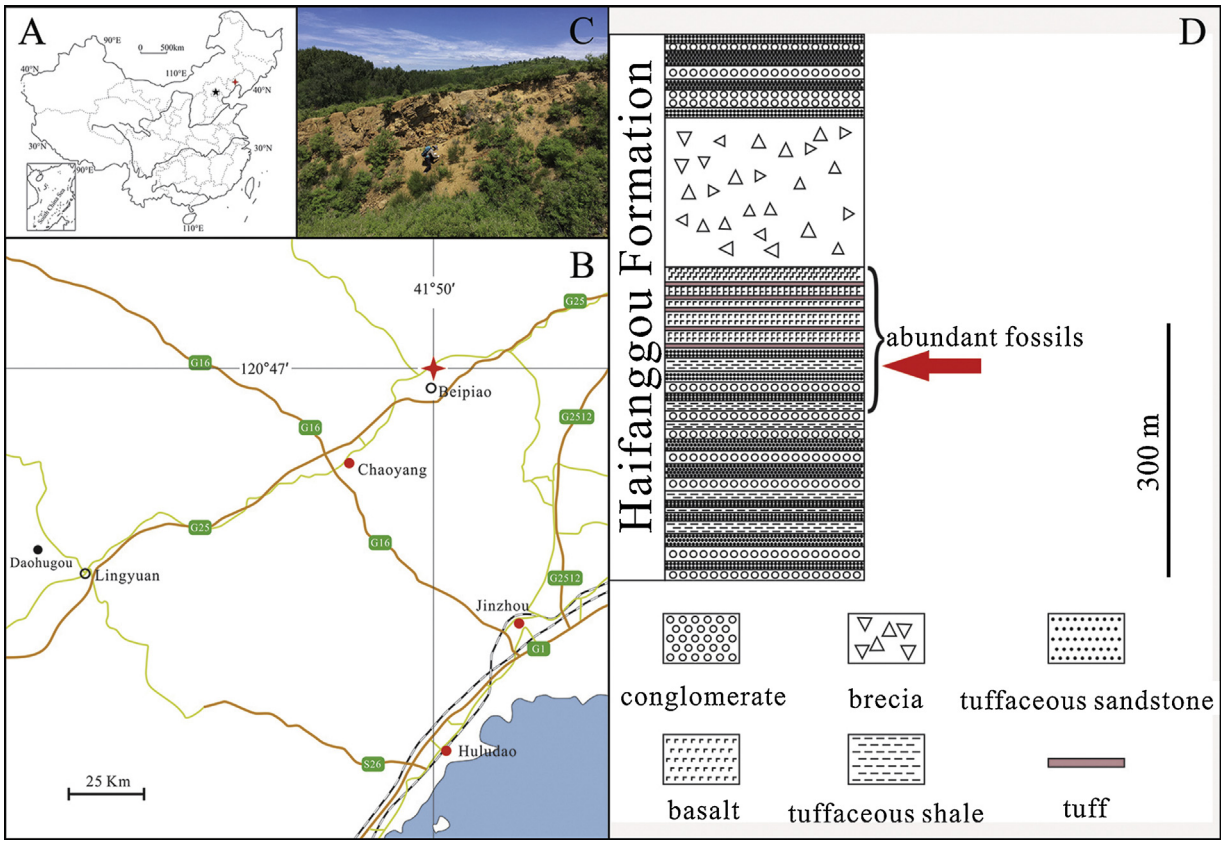

Fig. 1. Geographic and stratigraphic details of the orthoperan *A. gigantus* Ren and Meng, 2006. A and B. Geographic sketch map of Haifenggou Village, Beipiao City, Liaoning Province, China. C. Photo showing the fossil-bearing bed of the Haifanggou Formation. D. Stratigraphic column showing the lithology of the Haifanggou Formation and the position (arrow) of the material collected in the outcrop (revised from Chang et al., 2014).

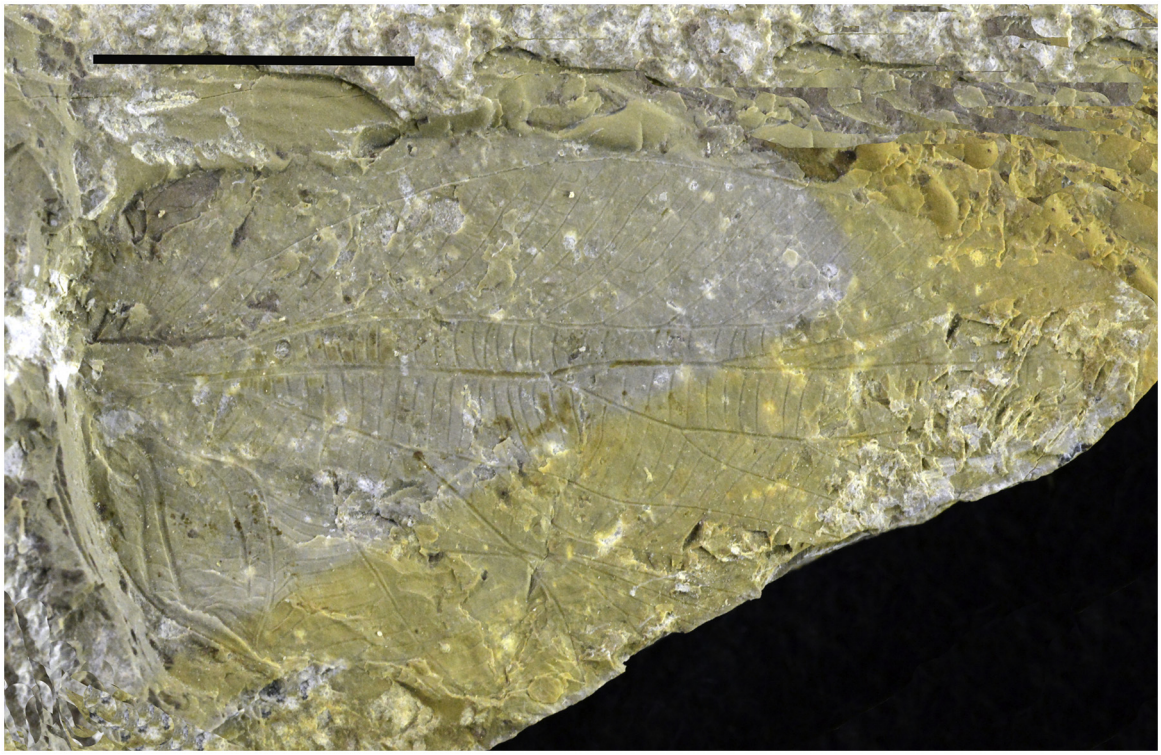

Fig. 2. Photograph of *A. gigantus* Ren and Meng, 2006, male forewing, NIGP166865. Scale bar represents 10 mm.

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