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The first evidence of a *Campylognathoides*—like pterosaur in the Toarcian (Lower Jurassic) Whitby Mudstone Formation of Lincolnshire, England

Michael O'Sullivan[a,*], Martin Rigby[b]

[a] School of Earth and Environmental Sciences, University of Portsmouth, Burnaby Building, Burnaby Road, Southsea, Hampshire, PO1 3QL, United Kingdom
[b] 2 Staley Hall Crescent, Stalybridge, Cheshire, SK15 3 DE, United Kingdom

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ABSTRACT

While pterosaurs occur in the Lower Jurassic strata of Britain and Germany, only the family Rhamphorhynchidae is currently known found in both. A newly discovered humerus from the Whitby Mudstone Formation of Lincolnshire challenges this and is distinguished from all other Lower Jurassic British pterosaurs by its possession of a quadrangular deltopectoral crest. This is a rare morphotype which only occurs in *Eudimorphodon*,*Austriadraco*, *Raeticodactylus*, *Carniadactylus* and *Campylognathoides*. The Lincolnshire humerus compares well with these taxa but is identified as a cf. *Campylognathoides* sp. based on its age and palaeobiogeography. The genus *Campylognathoides* is a common pterosaur in the Toarcian Posidonia Shale of Germany and the new humerus supports continuity of pterosaur populations across central Laurasia.

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1. Introduction

Pterosaur fossils are common within two European Lower Jurassic Toarcian units, the Posidonia Shale Formation of south-western Germany and the Lias Group of southern and north-western England. The Posidonia Shale Formation is a productive Konservat Lagerstätte known for its high numbers of exceptionally preserved reptiles including two pterosaur genera, 30+ specimens of *Dorygnathus banthensis* Wagner, 1860 and the less common *Campylognathoides liasicus* Strand, 1928 with ~12 specimens (Padian, 2008a, 2008b). The Lias Group has produced well preserved but isolated specimens of the basal pterosaur *Dimorphodon macronyx* Buckland, 1829, the skull of the basal pterosaur *Parapsicephalus purdoni* Arthaber, 1919 and an associated rhamphorhynchid scapulocoracoid and humerus (O'Sullivan et al., 2013). Currently, only the Rhamphorhynchidae is known from both Britain and Germany. However, a newly discovered isolated humerus provides evidence of a *Campylognathoides*-like pterosaur in Toarcian Britain.

Institutional abbreviations: AMNH — American Museum of Natural History, New York, USA; MNHM — Museum of Natural History, Paris, France; NHMUK — Natural History Museum, London; United Kingdom; SMNS — Staatliches Museum für Naturkunde, Stuttgart, Germany.

2. Materials and methods

The new specimen (NHMUK PV R 36712, Fig. 1) is an isolated humerus collected and prepared by MR in 2013, from the *Falciferum* Zone of the Whitby Mudstone Formation of the Lias Group in Winterton, Scunthorpe, Lincolnshire (Fig. 2). This is a sequence of bituminous and pyritous shales interbedded with calcareous nodules and some fossiliferous limestone layers (Simms, 2004). NHMUK PV R 36712 is preserved on a quadrangular slab of limestone alongside an ammonite identified as c.f. *Eleganticeras* (D. Martill pers. comm., 2013). Following its accession in the NHMUK, MOS performed a detailed comparative analysis on the specimen.

3. Description

Pterosauria Kaup, 1834
Campylognathoides Strand, 1928
c.f. *Campylognathoides* sp.

NHMUK PV R 36712 (Figs. 1 and 3) is a near complete left pterosaur humerus. It is 35 mm long proximodistally with a diaphyseal diameter of 4 mm at its midpoint. There is a planar

* Corresponding author.
E-mail address: michaelosullivanvp@gmail.com (M. O'Sullivan).

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Fig. 1. NHMUK PV R 36712, a left pterosaur humerus from the Whitby Mudstone Formation of Scunthorpe, Lincolnshire preserved in dorsal view. Scale = 10 mm.

break along the proximal face of the humeral head, exposing the internal trabeculae and thin bone walls. In dorsal view the diaphysis is straight with the morphology of the distal epiphysis obscured by the matrix. The base of the medial process is visible proximal to the break in posterior view but most of the body has broken off. The deltopectoral crest is 9.8 mm long proximodistally and 5.5 mm wide anteroposteriorly. The deltopectoral crest is quadrangular and not deflected away from the humeral head. The anterior margin of the deltopectoral crest appears sub-rounded with the proximal half extending further away from the main humeral body than the distal. This margin is not considered to be natural and appears to be overlain by the surrounding matrix.

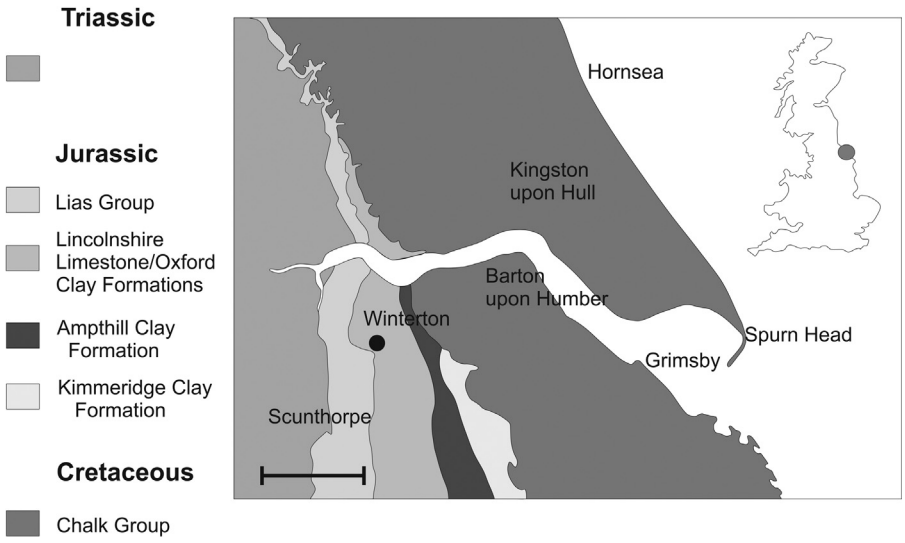

Fig. 2. Simplified geological map of the Scunthorpe area of Lincolnshire, England. NHMUK PV R 36712 was discovered in the area highlighted by the dot.

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