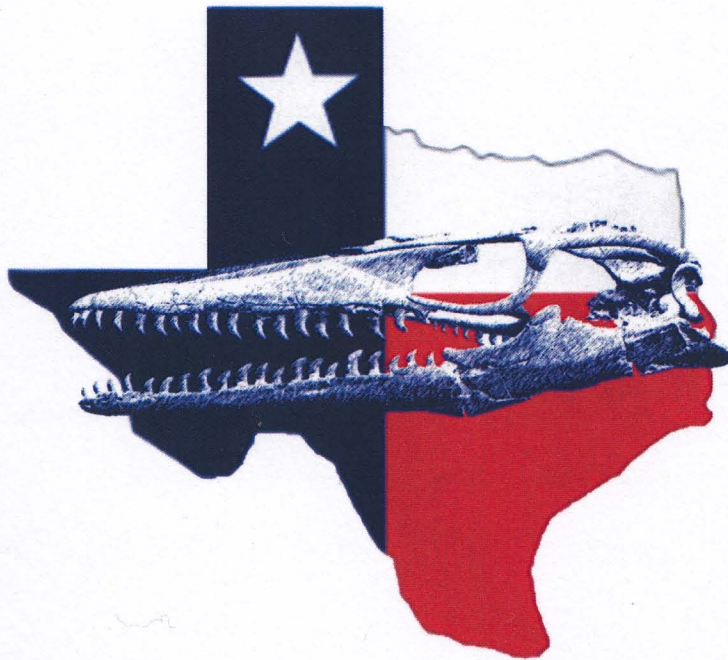




**4th Triennial
International Mosasaur Meeting
May 20-25, 2013
Dallas, Texas**

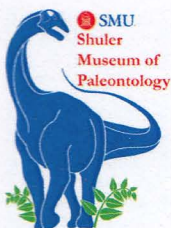
PROGRAM and ABSTRACTS

Michael J. Polcyn and Louis L. Jacobs, Editors

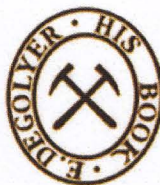
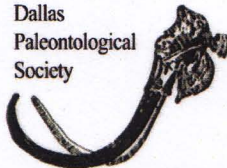


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CENOMANIAN-TURONIAN MOSASAUROIDS FROM THE BOHEMIAN CRETACEOUS BASIN

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The Bohemian Cretaceous Basin (BCB) is an intracontinental depositional depression that extends from Brno in eastern Moravia, through Bohemia to the north and west of Prague, and across the Czech-German border into southern Saxony around Dresden. During the early Late Cretaceous, the BCB formed part of the continuous peri-Tethyan shelf of central and southern Europe, which was inundated by a northwesterly trending marine transgression extending between the Tethys Ocean and the Boreal North Sea Basin. Fossils of marine amniotes that inhabited this shallow epicontinental seaway have been documented for over 155 years, but have attracted little recent research attention in comparison to other more famous localities elsewhere. Despite this, a comprehensive reassessment of existing museum collections, together with new excavations, has identified a succession of diverse assemblages spanning the late Cenomanian through to Turonian-Coniacian boundary. Conspicuous amongst the remains are the isolated bones and teeth of primitive mosasauroids. The stratigraphically oldest of these specimens derive from the late Cenomanian Dölzschen Formation around Dresden in eastern Germany, and include small teeth and a bone fragment possibly representing the posterior condyle of a procoelous centrum. Unfortunately, only the indeterminate vertebral component is compatible with Mosasauroidae, the teeth probably being attributable to enchodontid teleosts. More clearly diagnostic are a partial dorsal vertebra, a well-preserved maxilla, and some isolated tooth crowns from early-late Turonian strata of the Bílá Hora, Jizera, and Teplice formations in the Bohemian region of the Czech Republic. The maxilla in particular displays a premaxillary contact that is situated anterior to the midline of the fourth maxillary tooth position, a characteristic trait of Tethysaurinae. The dorsal vertebra likewise manifests a tethysaurine-like dorsoventrally compressed, reniform condylar outline, but the articular face is sub-vertical thus resembling *Dallasaurus* and derived mosasaurines. The identification of potential tethysaurines in the BCB is consistent with the hypothesized distributional restriction of early mosasauroids to a mid-low palaeolatitude, warm-water belt during the Turonian. Moreover, their sympatric occurrence with some of the last plesiosaurian megacarnivores warrants further investigation, especially in the light of possible ecomorph replacement by advanced mosasauroids later in the Cretaceous.

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INTRODUCTION

The Cenomanian-Turonian represented a critical time of biodiversity turnover amongst Mesozoic marine amniotes. It incorporated the last appearances of macrophagous pliosauro-morphs (Plesiosauria: Schumacher 2011), the divergence of modern chelonid sea turtles (Chelonioida: Hirayama 1997), and the radiation of aquatic mosasauroid lizards (Mosasauroida: Bardet *et al.* 2008). Although, fossiliferous deposits of this age are generally poorly sampled (Benson *et al.* 2010), the Late Cretaceous European Platform, which formed a shallow marine shelf adjacent to the Tethyan oceanic area, has had a long history of discoveries from what are now the chalk-marl, limestone, and glauconitic sandstone strata of the Bohemian Cretaceous Basin [BCB] in the Czech Republic and Germany.

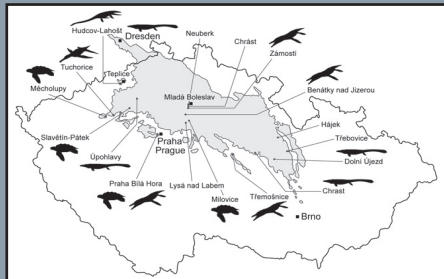


Figure 1. Diagrammatic map showing the boundaries of the Bohemian Cretaceous Basin in the Czech Republic and Germany with the distribution of identifiable marine amniote fossil occurrences (developed from Ekr *et al.* 2001).

The BCB formed via intracontinental faulting of the Bohemian Massif during the middle Cretaceous (Uliný 2001). Its extremities today extend from Brno in eastern Moravia, across northwestern Bohemia to the north and west of Prague, and over the German border into southern Saxony around Dresden (Fig. 1).

The depositional sequence within the BCB comprises the Peruc-Korycany Formation and laterally equivalent Dölzschen Formation of the Czech Republic and Germany; these record a transition from estuarine to littoral marine conditions during the early-late Cenomanian (Čech 2011). Establishment of a shallow seaway between the Boreal North Sea Basin and the Tethys Ocean in the lower-middle Turonian is represented by the the Bílá Hora Formation, and sequentially overlying middle-late Turonian Jizera and upper Turonian-Coniacian Teplice formations, which reflect a transgressive off-shore setting (Čech 2011).

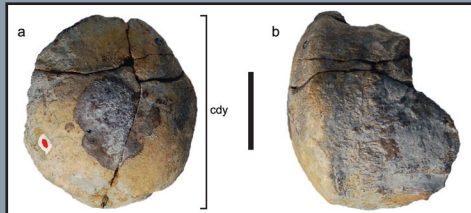


Figure 2. Potentially diagnostic aquatic squamate fossils from the Bohemian Cretaceous Basin in suburban Dresden, eastern Germany. Condylar articular surface of what might be an indeterminate mosasauroid vertebral centrum (SaK 1748) in (a) articular, and (b) lateral views. Scale bar represents 20mm. Abbreviation: cdy, condylar articular surface.

Repository abbreviations: NMP, National Museum in Prague, Czech Republic; SaK, Saxonian State Cretaceous Collection, Dresden, Germany. Artwork credits: Mosasaur life reconstruction, Josh Lee, Adelaide; CT Imaging, Josef Prok, Czech Technical University in Prague. Author's e-mails: Benjamin Kear (Corresponding author) <benjamin.kear@geo.uu.se>; Sven Sachs (Presenter) <sachs.pal@gmx.de>.

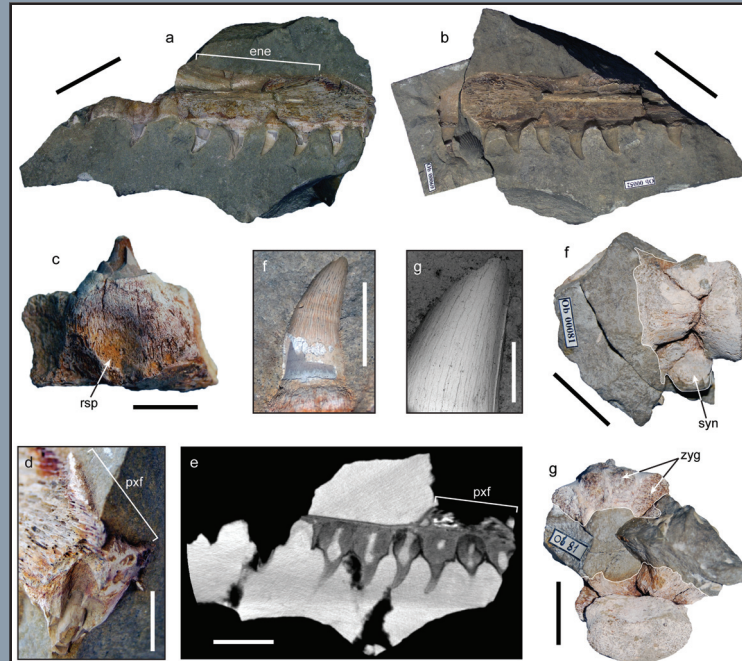


Figure 3. Diagnostic aquatic squamate fossils from the Bohemian Cretaceous Basin, Czech Republic. Tethysaurine maxilla (NMP Ob-00052, NMP Ob-00069, NMP Ob-00088) split into part (a) and counterpart (b) sections; (c) removed tooth base (NMP Ob-00071); (d) anterior view of premaxillary contact; (e) CT generated cross-section image through NMP Ob-00088 revealing extent of the premaxillary contact; (f) enlargement of the fourth maxillary tooth crown from NMP Ob-00088; (g) SEM image of the fourth maxillary tooth showing the smooth enamel surface and posterior carina. Indeterminate mosasauroid dorsal vertebra (NMP Ob-00081) in (i) ventral and (j) posterior views. Scale bars represent 50 mm in (a, b, e); 10 mm in (c, d, f); 4 mm in (g); 30 mm in (i, j). Abbreviations: ene, embayment for external nasal aperture; pxf, premaxillary facet; rsp, resorption pit; syn, synapophysis; zyg, zygapophysis / zygantrum.

Mosasauroid fossils from the BCB are very rare and have been recovered from commercially worked limestone quarries. Geinitz (1875) reported the stratigraphically oldest specimens in the late Cenomanian Dölzschen Formation in suburban Dresden, eastern Germany. These remains include small teeth and a bone fragment (SaK 1748) possibly representing the posterior condyle of a procoelous centrum (Fig. 2a, b). Unfortunately, only the indeterminate vertebral component is compatible with Mosasauroida; the teeth are probably attributable to enchodontid teleosts. Zahálka (1895) noted possible lizard remains from Nebužely in northern Bohemia, Czech Republic; however, these have likewise been reinterpreted as teleost fish (Ekr 2012). Fritsch (1905) introduced the historic mosasauroid taxa *Iserosaurus litoralis* and *Hunosaurus fasseli* but these represent indeterminate plesiosaurs. Zázvorka (1965) announced the first definitive mosasauroid from the BCB: a partial jaw from the Jizera Formation near Dolní Újezd in eastern Bohemia. More recently, Ekr *et al.* (2001) and Wiese *et al.* (2004) also figured an indeterminate mosasauroid tooth from the Teplice Formation at Úpohlavy in northwestern Bohemia.

The mosasauroid maxilla (NMP Ob-00052, NMP Ob-00069, NMP Ob-00088: Fig. 3a-e) reported by Zázvorka (1965) from Dolní Újezd bears teeth with expanded bony bases of attachment and posterolingual resorption pits (Fig. 3c), features indicative of mosasauroids (Bell 1997; Caldwell & Palci 2007). The premaxilla suture is delimited anteriorly by the fourth tooth position (Fig. 3d, e) as in mosasauroids (Caldwell 1999, 2000; Bardet *et al.* 2003), or more specifically, tethysaurine mosasauroids (Makádi *et al.* 2012). The tooth crowns (Fig. 3f, g) are posteromedially curved with smooth enamel surfaces and weak, unserrated carinae reminiscent of tethysaurines (Bardet *et al.* 2003; Polcyn & Bell 2005; Makádi *et al.* 2012). An isolated dorsal vertebra (NMP Ob-00088) from the Bílá Hora or Jizera Formation at Chrast possesses a posterior condyle that is reniform in outline and dorsoventrally compressed (Fig. 3f, g) as in tethysaurine mosasauroids (Makádi *et al.* 2012); however, there is only weak precondylar constriction and anterior inclination of the articular face. Bell & Polcyn (2005) reported that similar vertically oriented vertebral condyles distinguish *Dallassaurus* and mosasaurines.



Figure 4. Reconstruction of a tethysaurine mosasauroid similar to those that inhabited the Turonian epicontinental seaway of the BCB in Central Europe. Artwork courtesy of Josh Lee, Adelaide, Australia.

CONCLUSIONS

- (1) The recognition of probable tethysaurine mosasauroids from middle-upper Turonian sequences in the BCB is consistent with their low-mid palaeolatitudinal distribution based on finds from elsewhere (around 45° N to 30° S latitude: Jacobs *et al.* 2005). The group also seems to have persisted within the mid-latitude Northern European Platform region up until the Maastrichtian (e.g. *Pannoniasaurus*, Hungary: Makádi *et al.* 2012).
- (2) The co-occurrence of early mosasauroids and large-bodied pliosauro-morphs in the middle-upper Turonian of the BCB coincides with well-constrained North American records (Schumacher 2011), perhaps implying a simultaneous global replacement of the last plesiosaurian megacarnivores by derived mosasauroids sometime during the late Turonian.

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