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Technical Session 3: Terrestrial Ecosystems – Early Cretaceous (Saturday, June 10, 2023, 9:45 AM)

THE MID-CRETACEOUS FOSSIL RECORD OF CAENAGNATHIDS IN NORTH AMERICA AND ITS IMPLICATIONS FOR THE TIMING OF FAUNAL INTERCHANGE WITH ASIA

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Caenagnathids are toothless pennaraptoran theropods that are becoming increasingly common in Campano-Maastricthian of the Western Interior Basin. The last couple of decades have witnessed a surge in their known diversity with the naming of more than half a dozen new taxa (Funston, 2020), although the validity of some of these remains debated. The clade also has a growing fossil record in Asia including remarkably large-bodied taxa such as *Beibeilong sinensis* (Pu et al., 2017) and *Gigantoraptor erlianensis* (Xu et al., 2007). In contrast to their Campano-Maastrichtian record, the published pre-Campanian record of caenagnathids in North America is poorly known and restricted to the enigmatic small, and juvenile, holotype specimen of *Microvenator celer* from the Early Cretaceous Cloverly Formation. *Microvenator* was originally proposed to be an oviraptorosaur by Currie and Russell (1988), a point later confirmed through numerous phylogenetic analyses starting with Makovicky and Sues (1998).
The stratigraphic gap in the North American record between *Microvenator* and Campano-Maastrichtian taxa was until recently only punctuated by eggs and eggshell referred to the ootaxon *Macroelongatoolithus carlylei*, which is referred to caenagnathids based on embryonic remains (Simon et al., 2019). *M. carelylei* eggshell was first reported from the Cenomanian Mussentuchit member of the Cedar Mountain Formation by Jensen (1970) and named *Boletuoolithus carlylei* by Bray (1998), but later synonymized with the oogenus *Macroelongatoolithus* by Zelenitsky et al. (2000). *Macroelongatoolithus* eggs and eggshells are now known to occur in in the penecontemporaneous Wayan Fm. of Idaho, as well as more broadly in Asia (Simon et al., 2019; Zelenitsky et al., 2000). Near complete pairs of eggs have been collected from the Wayan Formation (Simon et al., 2019) and also the Mussentuchit Member (Zanno et al., 2019), exhibiting sizes consistent with being laid by a *Gigantoraptor*-sized animal.
Fieldwork by the Field Museum in the Mussentuchit Member (MM) of the Cedar Mountain Formation led to the discovery of body fossils that complement the earlier oological discoveries. Field Museum crews excavated the

partial skeleton of a large caenagnathid in 2012, including a pubis, femur, tibia, and caudal vertebrae forming a pygostyle-like structure. With a tibial length of 95 cm, this specimen is second only to the holotype of *Gigantoraptor* in size among oviraptorosaurs. The discovery of this specimen allowed for the reinterpretation of a small partial theropod skeleton collected by OMNH crews from the MM as a juvenile specimen of the same species based on several derived features of the distal femur. These include opposing longitudinal grooves on the tibiofibular crest and medial condyle that face each other across the popliteal fossa, and a conical process on the lateral distal condyle. The juvenile specimen was originally interpreted as the earliest occurrence of an ornithomimosaur in North America by Cifelli et al. (1996) (J. Kirkland, pers. comm.), a record we correct here. The new specimen provides new anatomical information on the pectoral girdle and forelimb of the species.

Femoral synapomorphies observed in the Mussentuchit material are also evident in an isolated femur collected from the Antlers Fm. of north Texas by a Field Museum party led by Rainer Zangerl. This nearly complete femur measures 34 cm in length and exhibits caenagnathid synapomorphies such as a reduced femoral neck, reduction of the 4th trochanter, well-developed muscle scar for the *m. caudifemoralis longus* on the posterior face of the distal shaft, and medially grooved tibiofibular crest. It represents the first verifiable caenagnathid specimen from the Antlers Formation, and thus both a major geographic range extension, as well as a possible stratigraphic one, for this clade in North America. It also adds to the already significant taxonomic overlap between the Antlers and Cloverly Formations, which share a majority of their named dinosaurian genera including *Tenontosaurus, Deinonychus, Acrocanthosaurus* and *Sauroposeidon*, in addition to caenagnathids.

Mid-Cretaceous terrestrial faunas of the WIB are best known from intensive microvertebrate sampling, a method that is biased against edentulous clades such as caenagnathids. As increased sampling and description of body fossils is reconciled with the microvertebrate record, a more informed picture of the pace and timing of faunal interchange between North America and Asia in the Cretaceous is coming together, indicating both an earlier onset of interchange that previously suggested, as well as more gradual turnover among North American lineages (Zanno & Makovicky, 2011).

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