

Four Overlapping Dinosaurs in Three Orientations: A Taphonomic Puzzle from the Lance Formation of Wyoming



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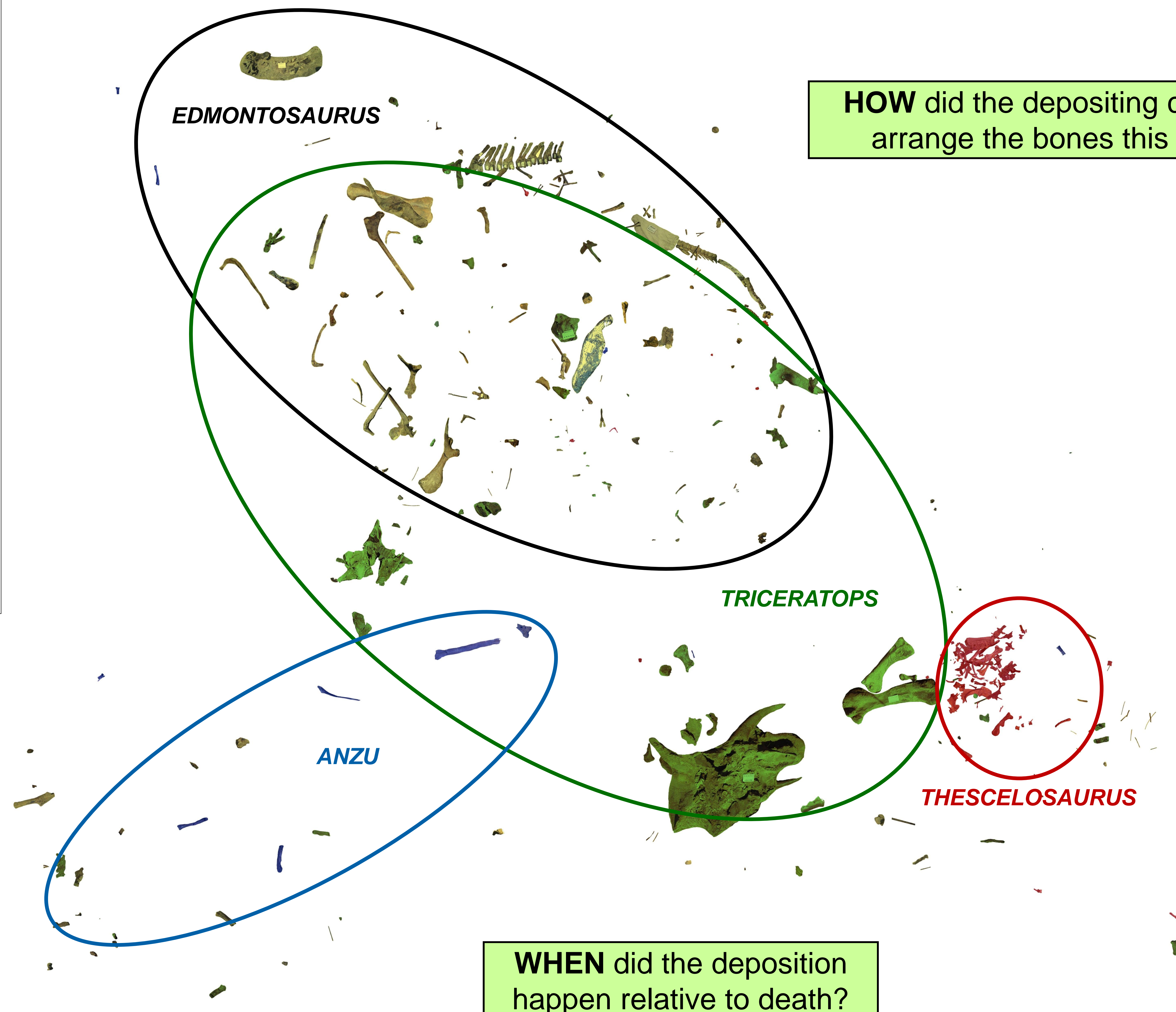
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Abstract

In the **Upper Cretaceous** deposits of western North America, monodominant hadrosaurid and ceratopsid and multitaxic microvertebrate bonebeds are commonly encountered, but **multitaxic macrovertebrate bonebeds are uncommon**. Long bones in these bonebeds often shows no strongly supported to weakly supported orientation trends. Between 2014 and 2017, we excavated an area approximately 150 m², discovering a peculiar multitaxic macrovertebrate assemblage in the Lance Formation of eastern Wyoming. Parts of three ornithischians, a *Triceratops*, a *Thescelosaurus*, and an *Edmontosaurus*, along with a caenagnathid theropod *Anzu* were uncovered. The partial remains of these four individuals are slightly disarticulated to disarticulated but associated. Other taxa are represented in the bonebed only by isolated elements. Compounding the uniqueness of this assemblage is the distribution of elements across the quarry. The majority of the approximately 115 bones of the *Thescelosaurus* are localized to a within a 3-meter circle. The skull, pubis, femur, tibia, metatarsals, and phalanges of the *Triceratops* are immediately adjacent to the *Thescelosaurus*, but are distributed in a northwest trend. Likewise the 70 articulated caudal vertebrae and disarticulated hip and limb elements from the *Edmontosaurus* exhibit a northwest orientation. Confoundingly, the associated tibia, fibula, astragalus, metatarsals, and caudal vertebrae of the *Anzu* point to the southwest. **The remains of all four individuals are in close proximity, overlapping, or partially overlapping, yet appear to be laid down in three different orientations.** These specimens seem to have been hydrodynamically transported here, but we don't fully understand how flowing water could generate this particular pattern of deposition. We will continue to excavate the site and study it's sedimentology to gain a better understanding of the assemblage's mysterious taphonomic history.

WHY are so many species buried together?

HELP US SOLVE THIS PUZZLE!



HOW did the depositing currents arrange the bones this way?

WHEN did the deposition happen relative to death?