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Selective Preservation of Fossil Ghost Fish

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A unique type of fossil fish preservation has been discovered in the Angelo Member (Fossil Lake) of the Green River Formation. The Angelo Member is a predominately evaporative deposit dominated by dolomite, but contains facies of fossiliferous laminated calcimicrite. Fossil fish occurring in two beds conspicuously lack bones. Fish in the lower bed are only preserved as organic material, including skin, pigments, and eyes. Fish in the upper bed have three-dimensional etching where bones once existed but also contain skin, pigments, and eyes. The top third of the upper bed often contains calcite crystals that are pseudomorphs after trona and possibly halite. Preliminary mineralogical analysis and mapping of evaporate facies suggests that this unique preservation may be related to lake geochemical conditions, such as high pH and alkalinity. To our knowledge, this is the first time this type of preservation has been observed and studied. Fossils and sediments within these beds are being studied both vertically and laterally through the one-meter thick sequence containing the fossil fish using XRD, isotopic, SEM, thin section, and total organic carbon analysis. Nine quarries, 0.5-1 meter square, were excavated for both fossils and rock samples along with 17 additional rock sample locations across an approximately 25-kilometer square region. This investigation has the capability of reconstructing the paleoenvironment and lake chemistry of Fossil Lake during the deposition of the "ghost-fish" beds and solving the mystery of the "missing bones" and the unusual process of preservation.