Chondrichthyan Microremains of Late-Mississippian Arkansas, a Refutation of Noachian Flood Models

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ABSTRACT

Specimens of Chondrichthyan teeth and denticles were recovered from the Carboniferous Pitkin formation of Arkansas by dissolving samples of limestone. Many taxa were identified from the samples, but no anatomically modern species could be located in any sample group. Creationist models of fossil distribution are discussed and found to be insufficient to explain the fossil record, especially in the context of microscopic Chondrichthyan remains of the Carboniferous period. Modern shark denticles and teeth are also compared to the samples found in this study. Hydrological sorting and ecological zonation simply do not appear to be adequate hypotheses for explaining these findings. Creationists are urged to find a hypothesis that better explains the microfossil Chondrichthy.

***Key Words**; Chondrichthyes; Carboniferous; Pitkin Formation; shark teeth; dermal denticles; microfossils; hydrological sorting; ecological zonation; Flood geology; fossil distribution; paleoecology; taphonomy.*

Introduction

Chondrichthyans include sharks, rays and chimeras. This diverse group of fish has had an incredibly long geologic history. Indeed, the first shark-like denticles are known from the middle Ordovician period (Sansom et al. 1996). Given their extensive modern geographic distribution, from pole to pole and shallow water to abyss, these fish are an excellent test bed for a number of aspects for the supposed Noah's Flood.

In the secular world, the Carboniferous period was a time of great Chondrichthyan diversity. However, none of the species found in Carboniferous (including late-Mississippian) strata are known to exist today. It is important to note that no overlap exists between modern Chondrichthyan species and those that are found in Carboniferous strata, including that of the Pitkin formation of Arkansas.

The Pitkin formation is made largely of limestone. Limestone readily dissolves in weak acid, such as household vinegar, which makes extracting microfossils from this type of rock quite easy and inexpensive in comparison to other rock types. The Pitkin formation also preserves a variety of macrofossils, including productid brachiopods, trilobites, crinoids and blastoids. Rarely, macroscopic shark teeth of Petalodus and Deltodus sharks are found here.

There are over 1,000 known species of modern Chondrichthyans in the world's oceans. Untold thousands more species are found in the fossil record. Sharks shed thousands of teeth and millions of dermal denticles over the course of their lives. In a global flood model, many of these denticles and teeth should be found in the same strata. The two prevailing models for explaining the fossil record in the context of a young earth and a global flood are hydrological sorting and ecological zonation.

Hydrological sorting would dictate that denticles and teeth of different sizes and densities should sort into layers. Ecological zonation would require that specific environments were preserved as fossil assemblages, giving the impression of a period of time in geologic history. Neither of these models are supported by the findings of this paper.

Materials and Methods

Limestone samples were collected from two localities within the Pitkin formation of Arkansas. These samples date to the late Mississippian epoch of the Carboniferous period, approximately 320 million years ago. These samples were dissolved in vinegar, and their contents placed on microscope slides. Chondrichthyan teeth and denticles were recovered, and several were imaged using a scanning electron microscope (SEM). SEM imagery was performed by the University of Central Arkansas and the Natural History Museum of Los Angeles County.

Results

No anatomically modern shark denticles or teeth were recovered from the Pitkin formation in any dissolved sample. No ray material was recovered at all. Approximately 50 Chondrichthyan teeth and denticles were recovered from the Pitkin formation in total. The material belongs to the following extinct groups.

Xenacanthimorphs, including Bransonella teeth.

Thrinacodontidae, including Thrinacodus teeth.

Stethacanthidae/Symmoriiforms, Including Stethacathus teeth and denticles.

Hybodontiformes, including Lissodus teeth.

Ctenacanthiformes, including large ~1 mm denticles.

Putative Orodontiformes and Protacrodontoidae were also recovered, including a large tooth plate almost 3 millimeters in length.

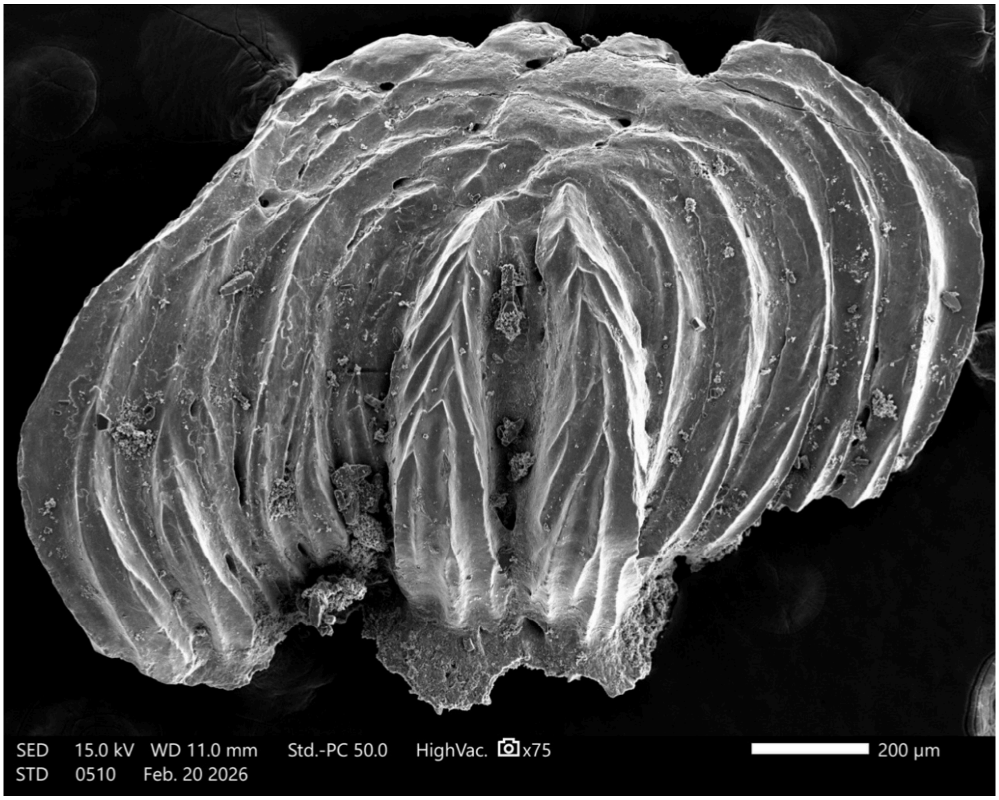

Figure 1. Scanning electron micrograph of the denticle of Ctenacanthiformes.

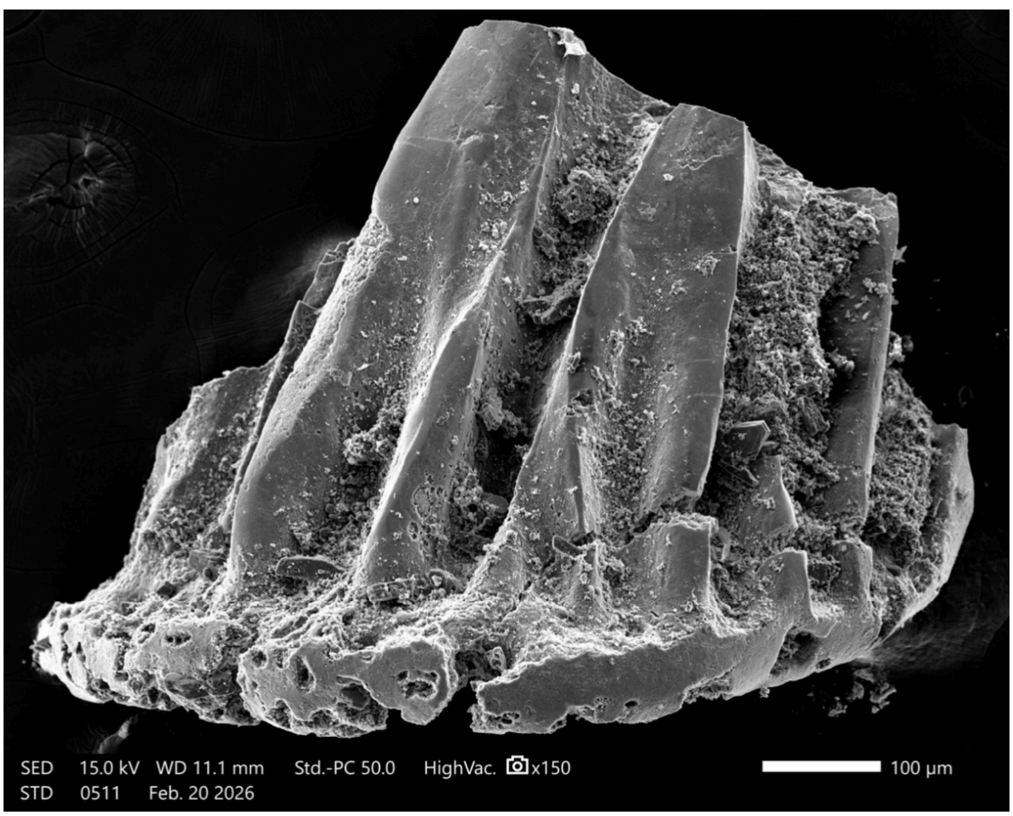

Figure 2. Scanning electron micrograph of a Symmoriiform buccopharyngeal denticle.

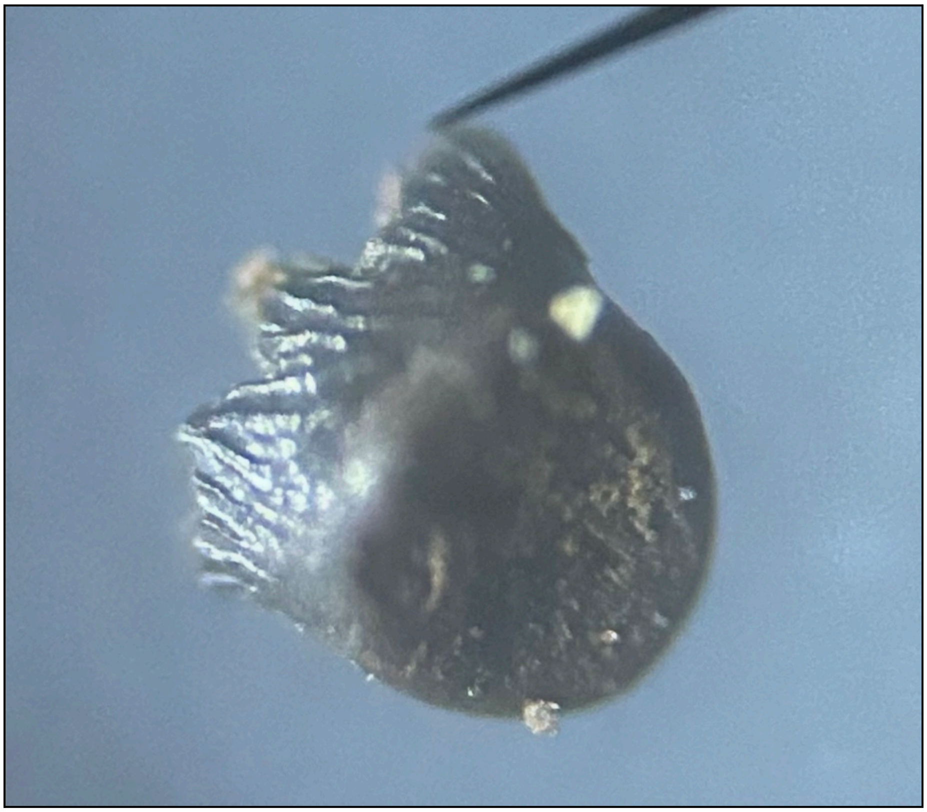

Figure 3. The tooth of the genus Bransonella under a light microscope.

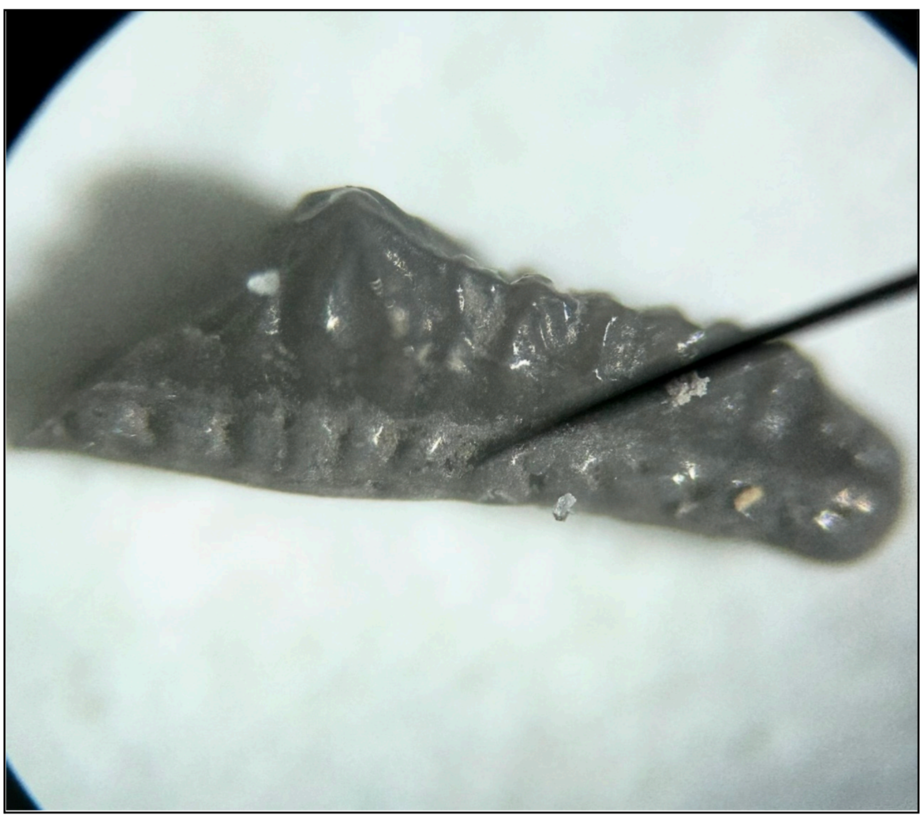

Figure 4. Putative Orodontiform tooth plate under a light microscope.

Discussion

Modern sharks have a global distribution and a wide variety of denticle and tooth sizes. Lantern sharks are known for submillimeter teeth and denticles (Claes et al. 2011), while Bramble sharks may have denticles over one centimeter in length (Battiata et al. 2024). Indeed, teeth of modern sharks range in size from submillimeter to several centimeters.

That the Pitkin formation assemblage certainly has the appearance of an ancient ecosystem would hardly be argued against. However, creationists form several hypotheses to account for these inconvenient findings. Hydrological sorting and ecological zonation are the two most common mechanisms to explain the fossil record for a young earth.

However, these hypotheses are quite problematic for Chondrichthyans. Modern sharks inhabit every marine habitat on earth, and many have teeth and denticles that are comparable in size and density to the specimens recovered in this study. These factors make it highly improbable that a modern denticle or tooth would not eventually turn up in the same strata as Carboniferous specimens recovered from the Pitkin formation of Arkansas, and indeed around the world (Hodnett and Elliott 2018); (Ginter and Sun 2007); (Ginter and Zlotnick 2019). It is almost impossible that modern teeth and denticles would be separated by either hydrological sorting or ecological zonation from denticles and teeth that are supposedly ancient.

The most common denticles found in the Pitkin formation assemblage were Ctenacanthiformes. These denticles are quite large at approximately one millimeter in size. However, many sub-millimeter sized denticles were also recovered from the same rock samples. Stethacanthus/Symmoriiform teeth and buccopharyngeal denticles were recovered from the formation as well. That these are different sizes and apparently different densities is quite problematic for hydrological sorting. It seems quite improbable that both teeth and denticles of Stethacathid sharks would be sorted into the same layer.

Ecological zonation is problematic for Chondrichthyans specifically because there is little zonation to speak of. Many shark species are cosmopolitan in distribution. Cat sharks inhabit the world's shallows, requiem sharks inhabit the world's open oceans. Indeed there is practically no place on the ocean bottom where denticles or teeth of modern sharks would not be collecting. This makes it especially puzzling for there to be no anatomically modern teeth or denticles in the Pitkin formation samples, or any Carboniferous samples anywhere in the world. That no ray material was found at all in the Pitkin limestone samples is also a problem for any flood model. Rays are globally distributed and have varying sizes of denticles and distinctive tooth plates.

Conclusion

There is no clear mechanism that can separate anatomically modern teeth and denticles from "ancient" teeth and denticles as many from each respective "time period" would have inhabited similar habitats and many are of similar size and density. The only logical conclusion seems to be a deep-time interpretation of the fossil record, until creationists can devise a hypothesis that adequately explains the observations outlined in this paper.

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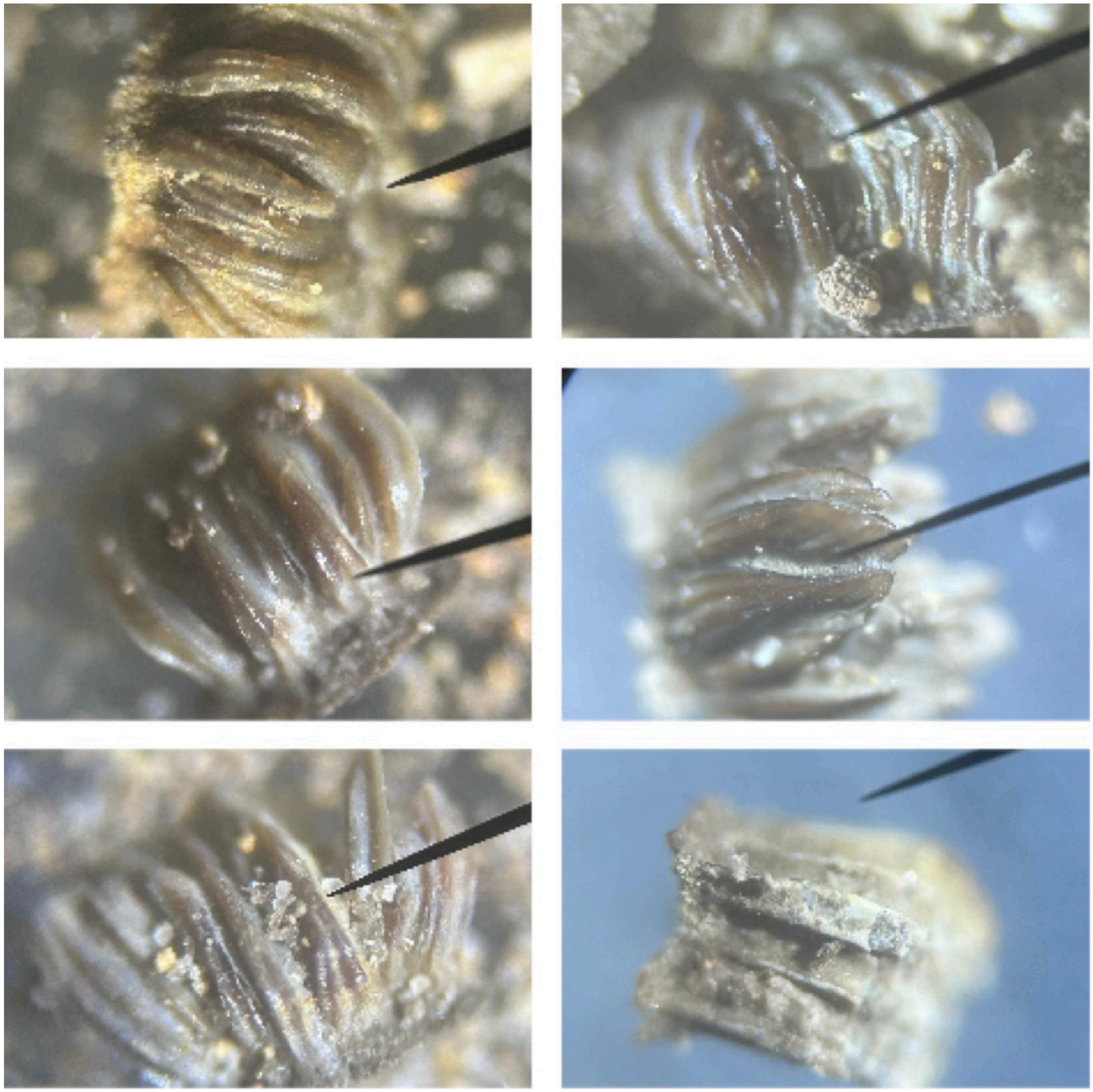

Plate 1. Ctenacanthiforme denticles imaged under a light microscope.