

Fish coprolites and new insights into the brackish Carboniferous ecosystem of the Joggins Formation

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The Joggins Fossil Cliffs UNESCO World Heritage Site (Nova Scotia) holds a wealth of fossils, terrestrial and aquatic, from the Late Carboniferous Period. Fossils from the aquatic realm have historically been understudied and the ecosystem they represent is poorly understood. Our research aims to broaden our understanding of the aquatic ecosystem, specifically the food web, by examining fish coprolites, which are abundant in the limestones of the Joggins Formation. Coprolites preserve undigested material that gives us a window into the diets of fish and the interactions between species. The coprolites have been studied in thin section and hand sample, as well as cathodoluminescence and computed tomography to determine their contents. We found that specimens could be divided into six categories based on size and shape: cigar/cylindrical; conical; small/ equant; spiral; irregular; and massive (samples greater than 5 cm in length). The small coprolites are the most abundant and the massive coprolites are the rarest. They range in size from <1 cm to >10 cm and are 2–3 centimetres on average. The composition of the coprolites is high calcium phosphate, similar to that of bone. This observation suggests that the fish producing the coprolites were carnivorous and that herbivores were lacking. Bone fragments have been found in almost all samples, however species identification has not been possible thus far. This research provides both a foundation for further studies on coprolites and a deeper understanding of aquatic ecosystems as fish diversified further into fresh water during the Paleozoic.