Evidence of fossil horseshoe crabs from the Joggins Fossil Cliffs – paleoichnology and paleonvironmental implications

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The Joggins Fossil Cliffs were inscribed as a UNESCO World Heritage Site in July 2008 and represent the world's finest example of a Coal Age ecosystem. This 15 km-long coastal cliff section displays multiple horizons of fossilized Carboniferous (310–325 Ma) forests. The Joggins fossil cliffs have yielded more than 200 different species of plants and animals, including the fossil record's earliest known amniote (*Hylonomous lyelli*) and the earliest land snail (*Dendropupa vetusa*),which are found entombed within the erect fossil lycopsid trees. Body fossils of terrestrial biota are not the only evidence of life preserved in Joggins; a diverse trace fossil assemblage of trackways from both vertebrate and invertebrate life is also found at this site. The trace fossil record at Joggins is as impressive as the creatures themselves and adds an important piece to the puzzle of life during the Coal Age. Although sometimes regarded as less important than body fossils, trace fossils provide important information about the locomotion and behaviour of prehistoric fauna and in some cases are the only evidence of a creature's existence. The existence of horseshoe crab activity within the Joggins Formation is well known; however, it remains a poorly studied part of the Coal Age ecosystem.

We present here an overview of the paleoichnology of Carboniferous limulids from the Joggins Fossil Cliffs and their paleoenviromental implications of a possible coastal connection. Unquestionable undertracks of these limulids have been discovered, examined, and identified as the morphological equivalent to small-scale specimens of the ichnogenus *Diplichnites*. The ichnogenus *Diplichnites* is currently assigned to myriapods, including the colossal two metre long, half metre wide *Arthropleura*. The similarity between the two ichnofossils poses problems for the taxonomy of an already confusing ichnotaxa. On the other hand, it also explains the close proximity of both *Koupichnium* (limulid) and small-scale *Diplichnites* (myriapod) trackways within the same paleoenvironment, which is an unlikely association. This issue is reviewed and possible solutions proposed.

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