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Geotourism: Joggins Fossil Cliffs, Nova Scotia - A Carboniferous (320-million-year-old) Highly Diverse Paleoecology and a UNESCO World Heritage Site

Tako Koning, P. Geol, Senior Geologist
Independent Calgary-based Consultant

The Joggins Fossils Cliffs has been described in the literature as a “Coal Age Galapogos” (Calder, 2017). The world-famous fossils-rich cliffs at Joggins have been recognized as a UNESCO World Heritage Site for their outstanding geological story of the “Coal Age”. Approximately 320 million years ago, the continents were assembled into one huge land mass, the supercontinent Pangea and tropic rainforests covered the region. From fossilized trees that stood 30 meters high to the remains of the earliest known reptile, *Hylonomus lyelli*, Joggins Fossil Cliffs hold essential information about the development of life on earth during the Carboniferous. The fossil cliffs reveal the world’s most complete record of terrestrial life during the Carboniferous. The cliffs are still actively evolving – the powerful tides from the Bay of Fundy continue to erode the rock face so that new fossils come to light every year (Calder, 2017, Joggins Fossils Cliffs Field Guide, 2024).

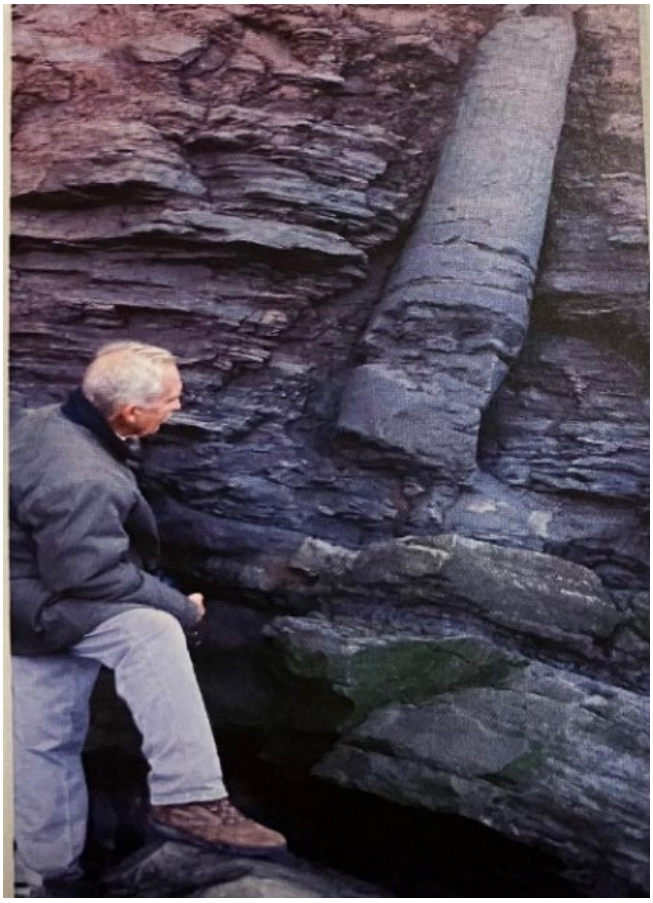


Figure 1. A standing lycopsid tree fossil.
From: Calder, J., 2017

THE FOSSIL RECORD AT JOGGINS

The following four paragraphs are directly excerpted from the book *Joggins Fossil Cliffs – Coal Age Galapogos* authored by John Calder in 2017.

Joggins is most famous for its record of life on land. The fossil record contains creatures and plants great and small, at every level of the food chain. The plant record contains specimens that range in size from the towering lycopsid trees, up to a meter in diameter, to their spores which can only be seen under the microscope. The record of animal life ranges from simple land snails to the most highly evolved animal of the day, the earliest reptile Hylonomus. Life in the waters that surrounded Joggins wetlands is less well known but is nearly as diverse as the record of animal life on land.

Joggins is best known for its fossil trees, preserved in the place where they grew millions of years ago, and for the fossil land-dwelling reptiles and amphibians, together known as tetrapods. Nineteen different species of reptiles and amphibians, all named for the first time from Joggins, have been discovered so far. They range from tiny microsaurs the site of salamanders to the fearsome, lumbering "Rex", a mysterious creature between one and two meters long, but as yet known only from a few telltale fossilized teeth and bones and from its deep footprints.

Studying tetrapods from Joggins, paleontologists face the challenge of distinguishing reptiles from amphibians. This is because coal-age tetrapods were just developing the characteristics that today set them apart. One of the key characteristics is the ability of reptiles to lay eggs on land. As yet, however, no fossilized eggs have been discovered at Joggins on any other coal-age fossil site.

The list of fossils found at Joggins continues to grow from Sir William Dawson's impressive start in the 19th century. At least 215 species of plant and animal fossils are known so far. The preservation of fossilized life forms at Joggins in the place where the ancient plants and animals lived makes them all the more valuable to paleontologists and geologists who try to reconstruct their world.

Joggins Cliffs – A World Famous Paleontological Site

Some of the world's most famous geologists and paleontologists visited Joggins beginning almost two hundred years ago. For example, in 1842 the British geologist, Sir Charles Lyell wrote in a letter to a relative "*We have just returned from an expedition wither I went to see a forest of fossil coal-trees, the most wonderful phenomenon perhaps that I have ever seen*". In 1871, he also wrote in his book *The Student's Elements of Geology* the following: "*Joggins is the best example in the world of a natural exposure in a continuous section ten miles long, occurs in the sea cliffs bordering a branch of the Bay of Fund in Nova Scotia".*

Charles Darwin did not visit Joggins but based on information provided by Charles Lyell and others he commended Joggins as *"having the most outstanding Coal Age exposure in the world".* In Darwin's book *"The Origin of Species*", published in 1859, Darwin referred to the tiny land snail *Dendropupa vetusta* found at Joggins. Accordingly, this tiny and seemingly insignificant snail had a direct impact on the thinking of Charles Darwin, the world's most famous evolutionist.

The great Canadian paleontologist Sir William Dawson also investigated Joggins in the 1850s. Sir William Logan was another noteworthy Canadian who was involved with initial research at Joggins. He was newly appointed as the first Director of the Geological Survey of Canada. His first field project was in 1843 and consisted of describing and measuring the strata at Joggins.

The celebrated author and evolutionary scientist Stephen Jay Gould, long-time professor at Harvard University, also visited Joggins in approximately 1990.

BIOGRAPHY

Tako Koning is Holland-born and Alberta-raised. He graduated from the University of Alberta in 1971 with a B.Sc. in Geology and with a B.A. in Economics in 1981 from the University of Calgary. He has worked as a petroleum geologist, exploration manager, vice president exploration for approximately fifty years including twenty years in Calgary and thirty years living and working in Indonesia, Nigeria and Angola. From age ten, he was already fascinated with paleontology and that fascination has continued to the present day. This presentation is based on a one-day visit in 2024 made by Tako to Joggins Fossils Cliffs and includes an extensive review of all available relevant literature. Please email Tako at tako.koning@gmail.com if you wish electronic copies of the literature and references.