

A Fossil Lycopsid Forest Succession in the Classic Joggins Section of Nova Scotia: Paleoecology of a Disturbance-prone Pennsylvanian Wetland¹

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Standing lycopsid trees occur at 60 or more horizons within the 1425 m thick coal-bearing interval of the classic Carboniferous section at Joggins, with one of the most consistently productive intervals occurring between coals 29 (Fundy seam) and 32 of Logan (1845). Erect lepidodendrid trees, invariably rooted within an organic-rich substrate, are best preserved when entombed by heterolithic sandstone/mudstone units in the order of 3-4 m thick, inferred to represent the recurring overtopping of distributary channels of similar thickness. The setting of these forests and associated sediments is interpreted as a disturbance-prone interdistributary wetland system. The heterogeneity and disturbance inherent to this dynamic sedimentary environment are in accord with the floral record of the fossil forests and interpretation of the peat-forming wetlands as topogenous, rheotrophic forest swamps.

Candidates for the erect, *Stigmaria*-bearing trees, which range in diameter (dbh) from 25 to 50 cm, are found in prostrate compressions and represent a broad range of ecological preferences amongst the Lycopsida. This record, which is not significantly time averaged, closely parallels the megaspore record from thin peaty soils in which they are rooted, but differs significantly from the miospore record in studies of other, thicker coals. Dominant megaspores are *Tuberculatisporites mamillarus* and *Cystosporites diabolicus*, derived from *Sigillaria* and *Diaphorodendron* / *Lepidodendron* respectively. Intervening beds preserve a record of an extramire flora composed in the main of seed-bearing pteridosperms and gymnosperms (and ?progymnosperms). Reproductive adaptation to disturbance appears to have played a key role in ecological partitioning of plant communities within these wetlands. Burial of lycopsid trees by onset of heterolithic deposition resulted in the demise of entire forest stands. Disturbance tolerant *Calamites* regenerated in the episodically accruing sediment around the dead and dying lycopsid stands, a succession identified here as typical of Euramerican fossil forests. Rapid, ongoing subsidence of the basin accommodated the submergence of the fossil forests, and abiotic disturbance inherent to the seasonal climate facilitated their episodic entombment. Disturbance is inferred to have been mediated by short term (? seasonal) precipitation flux as suggested by the heterolithic strata and in the record of charred lycopsid trees, recording wildfire most probably ignited by lightning. Within this fossil forest interval is found a glimpse of animal life within the wetland ecosystem beyond the confines of the tree hollows, from whence the bulk of the terrestrial faunal record of Joggins historically derives.

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