

The Classic Pennsylvanian Locality of Joggins, Nova Scotia: Paleoecology of a Disturbance-prone Wetland Ecosystem¹

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The coastal cliff section at Joggins provides an unrivalled record of the terrestrial environment of tropical Euramerica. The 1400 m thick Joggins Formation (Langsettian) records peat-forming wetlands, their transition to open water and periodic sustained change to seasonal drylands, all punctuated by discrete flooding events. The wetlands formed part of a rapidly subsiding, shifting distributary system under a climate of seasonal precipitation flux prone to wildfire. Recent research into their paleoecology indicates that abiotic (allogenic) disturbance inherent to the wetlands exerted a fundamental influence on their paleoecology.

The paleobotanical record represents both mire (lycopsids) and extra-mire (sphenopsids, pteridosperms, gymnosperms and ?progymnosperms) plants partitioned by reproductive strategy. Lepidodendrid lycopsids, framework trees of the wetland ecosystem, are represented by a full spectrum of ecological preferences. Calamitean sphenopsids were an ubiquitous succession to buried lycopsid stands, their persistence in aggradational settings aided by vegetative propagation. The tolerance of seed-bearing pteridosperms and gymnosperms to moisture-deficit in terra firma habitats is a corollary to the advantage accorded reptiles by the amniotic egg.

Terrestrial invertebrates included predators (arachnids), but in the main comprised detritivores (arthropleurids, millipedes, land snails) that served as the major pathway from primary producers (plants) to higher trophic levels (carnivorous tetrapods). Absence of substantive herbivory by tetrapods, inferred by their dentition, suggests that 'modern' trophic interactions had yet to evolve. Baphetid stem tetrapods, probable top predators, as well as terrestrial amphibians and amniotes comprised the tetrapod fauna; some may have predated the largely unstudied but diverse aquatic community within the wetlands. Once hollow lycopsid trees, long held to have served as pitfalls for tetrapods, instead may record an ecological guild within the wetland ecosystem. Spatial and temporal heterogeneity of the environment favoured genetic variation and provided evolutionary opportunity for its terrestrial fauna, recorded by early representatives of invertebrate and vertebrate lineages including the earliest amniotes.

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