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The diversity of architectural models in cladoxyloids: insights from anatomically preserved *Cladoxylon taeniatum* specimens from France.

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The cladoxyloids s.l. are an extinct group famous for including some of the species that formed the first forests during the Middle Devonian. The group encompasses several arborescent taxa for which different architectural models have been proposed in the literature. However, all these models have focused on tree-sized cladoxyloids (i.e., *Pietzschia* or *Calamophyton*) and none has been proposed to date for smaller representatives of the group. In this study, we address this gap by analyzing 30 anatomically preserved specimens of *Cladoxylon taeniatum* from the early Carboniferous (Tournaisian) Lydiennes Formation of Southern France to investigate the habit and development of this species.

The specimens are axes 5 -11 mm in diameter, up to 95 mm long. They are assigned to *C. taeniatum* based primarily on their dissected stele shape, the presence of secondary xylem, and their trace emission pattern coming from multiple ribs. Some specimens show the base of lateral organs that can be followed after their individualization from the main axis. The adaxial-abaxial polarity of these second-order axes and the terete and dichotomous emissions they produce lead to the interpretation of *Cladoxylon taeniatum* as a stem with helically arranged rachis-like laterals that bear alternate, non-planated ultimate appendages.

Quantitative characters of the stele (e.g., number of ribs, diameter, primary and secondary xylem surface) were investigated using a principal component analysis coupled with a hierarchical clustering method on a sub-sample of well-preserved specimens. These analyses recover 4 groups that may correspond to different developmental stages of the plant.

Combined with qualitative findings from all the *Cladoxylon* specimens found in the Lydienne formation (n=53), these results allow us to propose two possible architectural models for *Cladoxylon taeniatum*.