

Completing the Tree of Life of Gentianales: an update from the Plant and Fungal Trees of Life (PAFTOL) project and related research initiatives

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The tree of life is a fundamental scientific knowledge for the exploration, prediction, and application of the properties of life on Earth. From the identification of species new to science to the discovery of novel biomolecules or crops, the potential of the tree of life is immense but is yet to be fully explored because many of the tree's branches remain unknown. The first phase of the PAFTOL project at the RBG Kew successfully led, in partnerships with other institutions, to the development of a universal bait kit for target enrichment sequencing in flowering plants (Angiosperms353) and to the sequencing of more than 50% of the ca 13,600 genera. The molecular data generated were used in a wide number of studies highlighting the power of the approach for research in taxonomy, phylogenetics, and biogeography questions. PAFTOL subscribes to an open data agenda and aims to release its data early via the Tree of Life Explorer (<https://treeoflife.kew.org/>). This portal provides access to raw data, intermediate products (i.e. assembled data, alignments, gene trees) and a navigable tree of life based on all released data to date. The second phase of PAFTOL was launched with the aim of producing phylogenomic data for the remaining genera of Angiosperms. Among the largest orders, Gentianales is a priority group for which a large collaborating group was assembled, to source material and collaborate on research outputs. In this presentation, we report our progress towards completing a genus-level phylogeny for the estimated 1,100 genera of Gentianales. We discuss initiatives that take advantage of the data generated, including research to accelerate drug discovery, as well as species level studies using the Angiosperms353 probes to resolve relationships in the economically important taxonomic group, the *Asclepias* generic complex (Apocynaceae) and assist in the identification of putative new species of *Faramea* (Rubiaceae).