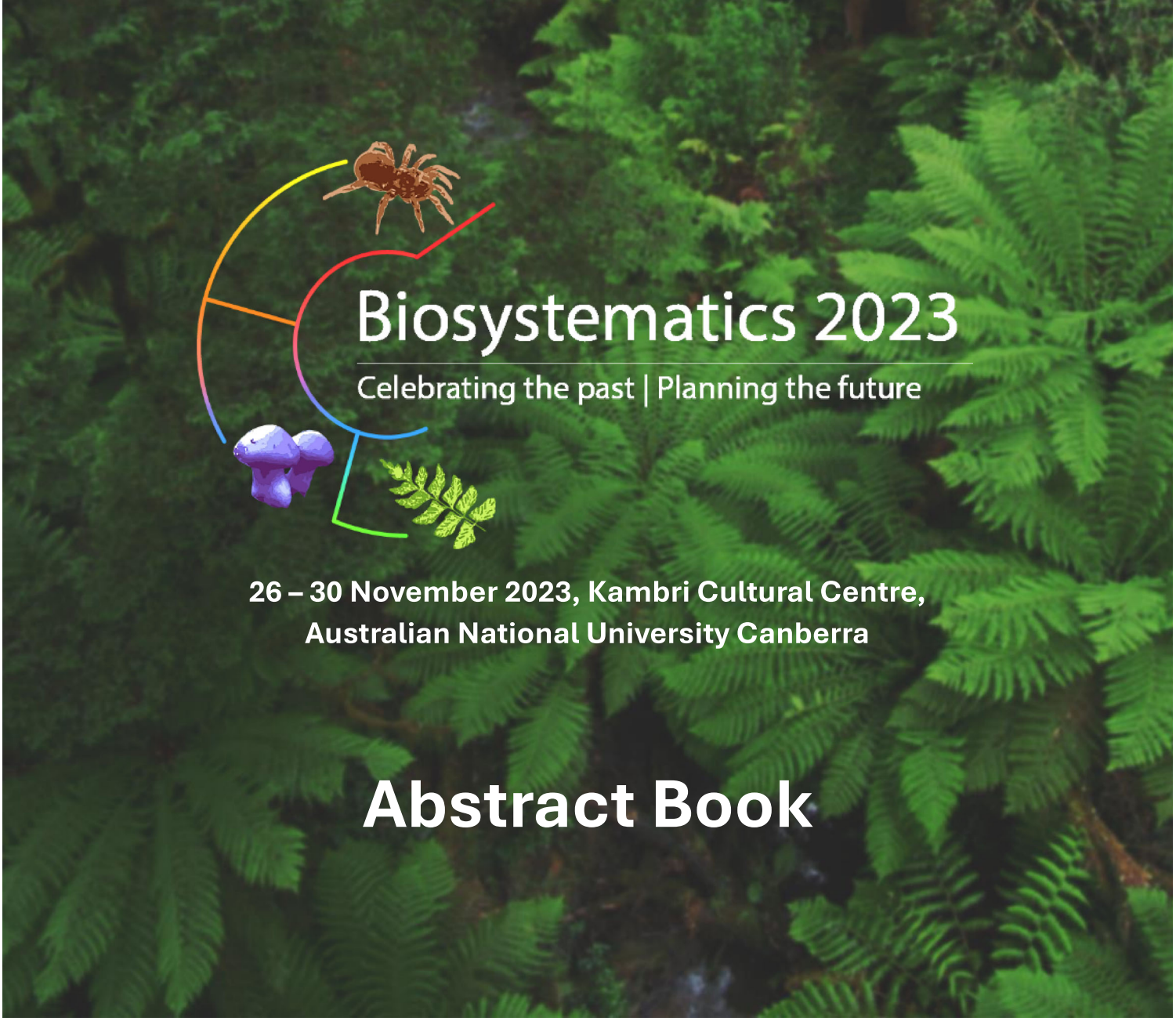

Biosystematics 2023

Celebrating the past | Planning the future

26 – 30 November 2023, Kambri Cultural Centre,
Australian National University Canberra

Abstract Book

Joint conference of the Australian Biological Resources Study, Society of Australian Systematic Biologists, Australasian Mycological Society and Australasian Systematic Botany Society

Celebrating 50 years of the Australian Biological Resources Study
& 50 years of the Australasian Systematic Botany Society

Biosystematics 2023
Celebrating the past | Planning the future

Plastid phylogenomics reveals evolutionary relationships in the mycoheterotrophic orchid genus *Dipodium* and provides insights into plastid gene degeneration.

Stephanie Goedderz (Australian Tropical Herbarium, James Cook University, Cairns and University of Hohenheim, Germany); Mark A. Clements (Centre for Australian National Biodiversity Research (joint venture between Parks Australia and CSIRO), Canberra); Stephen J. Bent (Data61 (CSIRO), Brisbane); James A. Nicholls (Australian National Insect Collection (CSIRO) Canberra); Vidushi S. Patel (National Research Collections Australia (CSIRO), Canberra); Philipp M. Schlüter (University of Hohenheim, Germany); Katharina Nargar (Australian Tropical Herbarium, James Cook University, Cairns and National Research Collections Australia (CSIRO), Canberra).

The orchid genus *Dipodium* R.Br. (Epidendroideae) comprises leafy autotrophic and leafless mycoheterotrophic species, the latter confined to sect. *Dipodium*. This study examined plastome degeneration in *Dipodium* in a phylogenomic and temporal context. Whole plastomes were reconstructed and annotated for 24 *Dipodium* samples representing over 80% of species diversity in sect. *Dipodium*. Phylogenomic analysis based on 68 plastid loci including a broad outgroup sampling across Orchidaceae found sect. *Leopardanthus* as sister lineage to sect. *Dipodium.* The leafy autotrophic species within sect. *Dipodium* (*D. ensifolium*) was found sister to all leafless, mycoheterotropic species, supporting a single evolutionary origin of mycoheterotrophy in the genus. Divergence time estimations found that *Dipodium* diversified ca. 11.3 Ma in the mid Miocene and the origin of mycoheterotrophy in the genus was estimated to have occurred in the late Miocene ca. 7.3 Ma, in sect. *Dipodium*. The comparative assessment of plastome structure in *Dipodium* revealed different degrees of plastid gene degradation of *ndh* genes within the genus, which ranged from moderately pseudogenised to physically lost, including leafy autotrophic species of both *Dipodium* sections. Our study showed that *Dipodium* exhibits an early stage of plastid genome degradation in which all species have retained a full set of functional photosynthesis-related genes and housekeeping genes.

Stephanie Goedderz: stephanie.goedderz@jcu.edu.au