**New Approaches for the Conservation Genomics of the**

**Genus *Cycas* L. in Australia**

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**Summary of Final Report**

More than sixty percent of Cycad species are threatened with extinction in the near future, with many existing in small and isolated populations. As a result, understanding their diversity is imperative for their conservation to ensure their long-term survival. In order to understand the diversity of cycads, genetics plays a fundamental role in helping us to identify how populations differ from one another. Australia represents a diversity hotspot for cycads where there are many different species and also many large, clustered and undisturbed populations. This project uses the latest DNA sequencing technologies to understand the genetic diversity of populations of selected cycad species from the Northern Territory in Australia, namely: *Cycas armstrongii*, *C. calcicola*, *C. maconochiei* subsp. *maconochiei* and a hybrid population *C. armstrongii* x *C. maconochiei*. Our results found that populations of *C. calcicola* showed evidence of inbreeding and low genetic diversity which correlated with geographic distance between major regions. The geographic disjunction between populations in the Katherine and Litchfield National Park regions were also confirmed to be disjunct based on genetic evidence. The results also showed that genetic diversity of *C. calcicola* was not well represented in botanic garden collections, presenting conservation concerns. *Cycas* *armstrongii* and *C. maconochiei* subsp. *maconochiei* populations also showed low levels of genetic diversity, but less inbreeding when compared to *C. calcicola*. In addition, based on the DNA evidence, we found no genetic difference between *C. armstrongii* and *C. maconochiei* subsp. *maconochiei*, despite looking very different. Furthermore, these findings show that the notion of a hybrid between the two species (*C. armstrongii* x *C. maconochiei*) is invalid and that these populations can be assigned to single species. Our results will have far-reaching significance for the conservation of vulnerable populations of cycads. In the case of *C. calcicola*, a far more structured acquisition of seeds from the wild will be required so that the species can be better preserved in botanic gardens.