Dr Tonia Cochran

Saving ancient plants from extinction

Inala Jurassic Garden's Noah's Ark project

Aerial view of Inala Jurassic Garden within the 600-ha Inala property, South Bruny Island Tasmania, photo Brad Moriarty, Inala

The ancient Gondwanan supercontinent conjures up images of dinosaurs, pterosaurs, giant horsetails and araucarias. The dinosaurs and flying reptiles are long since gone and Gondwana has fragmented but the ancestors of many of the plant families around at that time are still with us, albeit now geographically widely spread. The earth's plate tectonics caused what are today's southern continents to 'drift' apart incrementally over the eons, carrying their floral passengers with them. Araucarias are little changed from their dinosaur-cohabiting predecessors and still dominate the landscapes in which they grow. This family has been around for 200 million years, so it is distressing to know that many are now facing extinction because of the human impact from overharvesting and an unprecedented rate of climate change!

The Inala Jurassic Garden (IJG) is a small, privately-owned botanic garden located at *Inala*, on Bruny Island, off Tasmania's south-eastern coast. It is a repository for more than 700 species of plants with Gondwanan connections, planted in family groups for easy comparison of species from the southern continents (especially Australia, New Zealand, New Caledonia, South America and South Africa). Its relatively remote location on an 'island off an island off an island', which is only accessible by vehicle ferry or boat, is a fitting setting for the *Jurassic Park*-like garden of living 'dinosaur plants'. The garden was originally designed to demonstrate the Gondwanan connections of these plants but, increasingly, the focus is to grow *ex-situ* insurance specimens of species at most risk of extinction. Many are already listed as threatened in the wild; their future looks bleak.

The IJG is now an accredited member of both Botanic Gardens Conservation International (BGCI) and ArbNet, an international community of arboreta and tree-focussed professionals. This enables IJG to collaborate with other botanic gardens and scientific institutions from around the world. These partnerships are essential to the effectiveness of global conservation programs.

The Mulanje cedar

IJG is in one such collaboration with Bedgebury Pinetum and Forest in Kent, United Kingdom (UK) to propagate and grow *ex-situ* specimens of Mulanje cedar (*Widdringtonia whytei*), from Malawi in Africa. Our project is funded from a BGCI/ArbNet grant in conjunction with the Mulanje Mountain Conservation Trust and the Forestry Research Institute of Malawi. The Mulanje cedar is listed as critically endangered and may be the first conifer to become extinct in the wild. With few remaining cone-bearing plants from which to obtain wild seed, the race is on to save the species before the germination rate of the stored seed falls below viable limits. Bedgebury Collections Manager Dan Luscombe and his team developed a method to germinate the seed, but these could not be grown successfully in the climatically unsuitable UK. The genus *Widdringtonia* is an African genus of four species in the southern cypress family (Cupressaceae: Callitroideae); their closest relatives are the Australian *Callitris* and *Actinostrobus*. The IJG is already successfully growing two other *Widdringtonia* species that are now producing cones with viable seed, and several species of *Callitris*; growing conditions for Mulanje cedar

Left Dan Luscombe, Collection Manager, Bedgebury Pinetum, and Tonia Cochran, Inala Jurassic Garden, with Mulanje cedar seedling at Bedgebury, photo Peter Daley

Right Myrtle beech (*Nothofagus cunninghamii*) has now been placed on the International Union for the Conservation of Nature Red List as a high-priority species because of the high incidence of myrtle wilt caused by disturbances from logging and other human activity, photo Tonia Cochran, Inala

Herbarium voucher specimen of *Bellendena montana* for GGI project, photo Catherine Young, Inala

are also thought to be suitable. And so, after two years of negotiating with Biosecurity Australia and the Conservation on International Trade in Endangered Species (CITES), IJG finally has permission to import some Mulanje cedar seed. Germination trials will commence soon, the aim being to grow and distribute this species to other Australian botanic gardens with a suitable climate, thereby perpetuating the species.

Myrtle beech

In another BGCI/ArbNet grant project, IJG is working with Wakehurst, Kew Gardens' wild botanic garden in Sussex (UK) to survey myrtle beech (*Nothofagus cunninghamii*) for myrtle wilt, a fungal disease causing great concern amongst experts associated with the *Nothofagus* Global Conservation Consortium project (led by Wakehurst, Kew). IJG is developing a survey technique to monitor myrtle wilt in the myrtle beech forest on Bruny Island. This will be a pilot study for more extensive future citizen science monitoring of the species' range in Victoria and Tasmania. The IJG team will also collect leaf samples for genetic sequencing at the Royal Botanic Garden Sydney (RBGS) and seeds for long-term storage in the seedbank facility at the Tasmanian Seed Conservation Centre based at the Royal Tasmanian Botanical Gardens (RTBG).

Genetic biodiversity

The plant specimens in the IJG have considerable genetic value. In 2021 IJG received of one of 14 grants awarded by the Global Genome Initiative (GGI)-Gardens program and the United States Botanic Garden (USBG) in Washington DC to collect genome-quality leaf tissue samples and prepare voucher herbarium specimens of more than 100 different species within 43 genera and 12 families from the IJG living collection.

These samples are now available to researchers through the Global Genome Biodiversity Network (GGBN), which aims to preserve and understand the genetic biodiversity of Earth's flora. During this process IJG became one of the four registered GGBN biorepository members in Australia. It has lodged the reference voucher specimens in the Tasmanian Herbarium to enable access by future researchers.

IJG is also a repository for many of Tasmania's paleoendemic flora, representatives of some of the world's most relictual plant lineages. These are under-represented in botanic collections around the world, primarily because of the difficulty of keeping them in cultivation.

IJG is also successfully growing and propagating King's holly (*Lomatia tasmanica*), a critically endangered member of the family Proteaceae, restricted to the extreme south-west of Tasmania. Only one colony covering an area of 1.2 km has been found in the wild and genetic analysis has shown that the plant is triploid and sterile, so the colony is clonal, only able to reproduce vegetatively. Fossil leaves of this species from this location have been dated at 43,600 years old. Given that the species is a clone and the fossils are probably from the same plant, it is possibly the oldest living plant in the world according to the RTBG.

The two-hectare IJG, which was opened to the public in March 2014, is tiny and young in comparison with most other botanic gardens

in the world. It is also unusual in that it is privately-owned and funded, originally created as a tourism and educational enterprise to augment a wildlife tourism business. However, a fortuitous combination of 'goldilocks' climatic conditions that allows the growth of a wide range of species, meeting the right people at the right time and a determination to achieve a positive conservation outcome has enabled IJG to punch above its weight in its active involvement in conservation programs, particularly with respect to mitigating climate change.

Biologist **Dr Tonia Cochran** is founder of the Inala Jurassic Garden and Inala Nature Tours' managing director/ lead guide. She has worked as a marine biologist at the University of Melbourne and Australian Antarctic Division.

A Wilkie's leatherwood *Eucryphia wilkiei,* a vulnerable species with a very restricted distribution from the summit of Mount Bartle Freer near Cairns, Queensland

B Many paleoendemic flora originate in Tasmanian alpine areas, including mountain rocket (*Bellendena montana*), King Billy pine (*Athrotaxis selaginoides*), pencil pine (*A. cupressoides*), fagus (*Nothofagus gunnii*) and creeping strawberry pine (*Microcachrys tetragona*), pictured, photo Brad Moriarty, Inala

C King's holly (*Lomatia tasmanica*) flower, photo Jon Esling, Inala