fostering research into the biology and cultivation of the Australian flora

Newsletter *No. 7* *New Series*

January 2008

President's Report 2007

The objective of the Australian Flora Foundation is to '*Foster research into the biology and cultivation of Australian plants'*. Progress in the past 12 months is illustrated by the final reports received.

- Dr Kirby's final report (1991) on microbial symbionts of Sturt's Desert Pea was missing from our files, but he has kindly supplied a replacement. His work showed that the symbionts are resistant to high temperatures (30 minutes at 120°C).
- Webster and Woodrow's (2005) final report was delayed while the authors published in refereed journals. The study 'Genetic diversity and plant propagation in the rare rainforest tree, *Ryparosa kurrangii*' showed that cassowary gut passage significantly improved seed germination, from 4% to 92%. This opens the way to an efficient method for propagating this rare tree.
- Delpratt and Shears' (2006) final report 'The effect of nitrogen fertility and mowing frequency on the persistence of twelve Australian perennial forbs in a planted grassland community' showed that the survival of forbs in grassland communities was poor, but was enhanced by annual mowing and harvesting of the communities, and by not providing nitrogenous fertiliser.
- Ashford and Palmer's (2007) final report 'Germination, establishment and mycorrhizal synthesis in the Epacrid *Woollsia pungens'* describes methods for propagating *Woollsia* from seed, and showed that for most vigorous growth the seedlings needed to be in growing medium inoculated with mycorrhiza isolated from plants growing in the wild.
- Orsheg's (2007) final report 'Seed longevity and viability in several plant species of Box-Ironbark Forests' examined patterns of in situ and ex situ seed longevity, dormancy and viability decay over three years for eight species. The report showed that the soil longevity of soft-seeded species rarely exceeded 12 months, but for hard seeded species usually exceeded 3 years. Given that fire events in these forests are becoming more rare, this suggests the likelihood of long term changes in species composition.

The full final reports, as well as nearly all previous final reports and publications arising from them, can be accessed on the Foundation's website at http://www.aff.org.au.

New research grants have been awarded to:

Dr Margaret Johnston, University of Queensland, for 'An evaluation of the temperature and daylength requirements of Australian potted colour species'

Carola Kuramotto De Bednarik, Australian National University, for 'The relative importance of fire regimes, environmental gradients and climate change for rainforest distribution in the Sydney region'

and Dr Peter Wilson and Dr Maurizio Rossetto, Royal Botanic Gardens Sydney, for 'Reproductive biology of the Magenta Lilly Pilly (*Syzygium paniculatum* and its implications for conservation'.

A significant activity this year has been the installation of a new executive, consisting of Peter Goodwin, President; Ian Cox, Secretary; Jenny Jobling, Treasurer and Vice Presidents Richard Williams and Charles Morris. Apart from a few hiccups, the transition has gone smoothly. Jenny has been a very active Treasurer, and apart from managing the financial transition to the new executive, has been able to provide reports which clearly show past and future commitments on grants.

Peter Goodwin **26th November 2007**

Summaries of Final Reports

Each year the Australian Flora Foundation funds a number of grants for research into the biology and cultivation of the Australian flora. While the grants are not usually large, they are often vital in enabling such projects to be undertaken. Many of the projects are conducted by honours or postgraduate students, hopefully stimulating their interest in research into Australia's flora. This work is only made possible by the generous support of donors and benefactors.

Presented here are brief summaries of completed projects. Full reports of these and other projects can be accessed on the Foundation's website www.aff.org.au

Genetic diversity and plant propagation in the rare rainforest tree, *Ryparosa kurrangii*

Bruce L. Webber and Ian E. Woodrow
School of Botany, The University of Melbourne, Victoria, 3010

The rare Australian rainforest tree *Ryparosa kurrangii* (Achariaceae) has a very restricted distribution and is only known from a small strip of coastal lowland tropical rainforest in far north Queensland, Australia. Attempts at vegetative propagation of the species were unsuccessful, despite significant callusing and shoot production on field-sampled greenstick cuttings. This precluded an investigation of the relationship between cutting strike rates and plant tissue cyanogenic capacity of the taxon, which was found to be highly variable. At a population level, foliar cyanide concentration varied considerably between 0.54 – 4.77 mg CN g-1 dw. A seed treatment trial found that cassowary gut passage significantly improved germination from 4% to 92%, and we were not able to replicate this result with simulated treatments. While high levels of fruit fly larval

infestation accounted for reduced seed viability, this predation was apparently reduced by cassowary gut passage.

Seed longevity and viability in several plant species of Box-Ironbark Forests

Corinna Orscheg, School of Anthropology, Geography and Environmental Studies, University of Melbourne, Parkville, Victoria 3010

Very little is known of ecological processes in threatened Victorian Box-Ironbark forests. This study examined patterns of in situ and ex situ seed longevity, dormancy and viability decay over three years for eight species. The species selected comprised three 'soft' seeded species (*Briza maxima, Eucalyptus tricarpa, Ozothamnus obcordata*) and five 'hard' seeded species of the Mimosaceae (three common species, *Acacia genistifolia*, *A. pycnantha* and *Pultenaea prostrata*, and two rare or threatened species *A. ausfeldii* and *A. williamsonii*).

Soft-seeded species all displayed in situ longevity patterns typical of species with a transient soil seedbank. For all three species *in situ,* seed loss was greatest after 12 months, however the source of seed loss varied. Seed was lost to decay for the two native species, while for the sole exotic species most seed was lost to germination. *Briza maxima* was also the only species for which seed was recovered after three years of *in situ* burial, albeit a very small fraction of the original amount buried (2.5%). Under *ex situ* storage the proportion of viable seed declined little over three years for three species examined (between 1.7% and 2.5%). For the two native species this suggests their soil seedbanks have the potential to contribute to regeneration beyond a year, however in situ conditions affecting seed decay prevent seed remaining in the soil seedbank for greater than a year.

For all hard-seeded species seed was recovered after three years of *in situ* burial, but the proportion of seed varied between species. The majority of seed from *Acacia ausfeldii*, *A. genistifolia* and *Pultenaea prostrata* was recovered after three years and viability differed little to that prior to burial. However, for *A. pycnantha* and *A. williamsonii* considerable seed was lost in situ, mostly due to germination.

Levels of dormancy also varied among hard-seeded species. Dormancy levels were initially high for all species prior to burial (c.98-100%), however proportions of dormant seed declined considerably for *A. pycnantha* and *A. williamsonii* (61.6±.9.1% and 50.4±.7.4% non-dormant seed respectively after three years of burial). Proportions of dormant seed also declined for *A. ausfeldii* and *A. genistifolia*, but not to the same degree (4.5±.1.3% and 15±.3.3% non-dormant seed after three years respectively). As heat associated with fire is a dormancy breaking cue in these species (Brown et al. 2000), this has consequences for species persistence considering that current fuel loads and accumulation rates in Box- Ironbark forest suggest infrequent fire events.

The effect of nitrogen fertility and mowing frequency on the persistence of twelve Australian perennial forbs in a planted grassland community

John Delpratt, The University of Melbourne, Burnley Campus, Richmond, Vic 3121, Email: jdelprat@unimelb.edu.au; Ian Shears, The Melbourne City Council, GPO Box 1603M, Melbourne, Vic 3001, Email: Ian.Shears@melbourne.vic.gov.au

Questions: What effect does the frequency of biomass removal have on the survival and productivity of a range of perennial native forbs? What effect does nitrogen availability have on the survival and productivity of a range of perennial native forbs? What effects do combinations of frequency of biomass removal and nitrogen availability have on the survival and productivity of a range of perennial native forbs?

Method: A native grassland community comprising Kangaroo Grass (*Themeda triandra*), Common Wallaby Grass (*Austrodanthonia caespitosa*) and twelve perennial forbs was planted in a pre-determined pattern into a constructed, weed free, low nutrient sub-soil plot. Two frequencies of biomass removal (annual; two-yearly) and two levels of nitrogen application (none; two-monthly applications of 10 g m-2 ammonium nitrate) were combined into four factorial treatments, maintained for four years. Biomass production of the component species and forb phenology and survival were recorded and analysed for the duration of the experiment.

Results: All species established well following a late autumn planting. Initially, the experimental plots were dominated by Wallaby Grass, to be replaced by Kangaroo Grass in the later years of the experiment. The survival and growth of the various forbs varied between species, depending on their life form and growth habit. Only one forb species, the geophytic Bulbine Lily (*Bulbine bulbosa*) survived in all treatments. Several forbs survived within one or more treatments, usually on annually harvested plots with no applied nitrogen. Two forbs, Bulbine Lily and Native Flax (*Linum marginale*) recruited heavily from seed during the course of the experiment.

Conclusions: Despite their on-going presence in many mown remnants, the reliable, long term persistence of colourful perennial native forbs in planted grassland communities remains problematic. Future research might focus on the density of planting, the frequency and timing of biomass removal and the species and population size of the planted forb components.

The Australian Flora Foundation is a not-for-profit organization with the sole objective of fostering scientific research into Australia's flora.

Email Contacts

Peter Goodwin (President) pbgoodwin@iinet.net.au
Ian Cox (Secretary) itcox@bigpond.com

Australian Flora Foundation Inc.
ABN 14 758 725 506
Box 41 Holme Building
University of Sydney NSW 2006
www.aff.org.au