



*fostering research into
the biology and cultivation
of the Australian flora*

Newsletter

No. 11

New Series

January 2010

President's Report for 2009

Here is the President's Report delivered to the Foundation's Annual General Meeting by Dr Peter Goodwin on 30th November 2009:

The Foundation continued its work to 'foster research into the biology and cultivation of Australian plants'.

The following five publications in scientific journals, all of which acknowledged financial support from the Australian Flora Foundation, were placed on the website in 2009:

'The effects of heat, smoke, leaching, scarification, temperature and NaCl salinity on the germination of Solanum centrale (the Australian bush tomato)' by A.K.

Ahmed *et al* appeared in Seed Science & Technology (2006) 34: 33-45

'The diversity of arbuscular mycorrhizas of selected Australian Fabaceae' by Mark Tibbett *et al* appeared in Plant Biosystems (2008) 142 (2): 420-427

'Germination in two Australian species of Frankenia , F. serpyllifolia Lindl. and F. foliosa J.M.Black (Frankeniaceae)– Effects of seed mass, seed age, light, and temperature' by Lyndlee Easton & Sonia Kleindorfer appeared in Transactions of the Royal Society of South Australia (2008) 132(1): 29-39

'Effects of salinity levels and seed mass on germination in Australian species of Frankenia (Frankeniaceae)' by Lyndlee Easton and Sonia Kleindorfer appeared in Environmental and Experimental Botany (2009) 65: 345-352

'Interaction effects of seed mass and temperature on germination in Australian species of Frankenia (Frankeniaceae)' by Lyndlee Easton and Sonia Kleindorfer which appeared in Folia Geobot (2008) 43: 383-396

In addition to these publications in refereed scientific journals, six new final reports on projects funded by the Foundation were received:

Geoff Woodall *'Cultivation of Native Potato'*

Lyndlee Easton *'Life histories and reproductive biology of plants in the desert and halophytic genus Frankenia (Frankeniaceae) in Australia'*

Alan Lymbery *'Measuring and managing the impact of secondary salinisation on riparian flora'*

Celeste Linde *'Mycorrhizal associations of Gastrolobium vestitum'*

Christine Cargill *'The biology and cultivation of Revwattsia fragilis (Watts) D.L.Jones'*

Melinda Perkins *'Pollination biology of Ptilotus axillaris'*

They are available on the Foundation's website

We have also awarded three new research grants, to be discussed later in this meeting.

I should like to gratefully acknowledge the work of Peter Kellaway. Peter has been auditing our accounts on an honorary basis for many years – since before I joined the Foundation in 1999, and perhaps for much longer. He has been prompt in that the audited accounts have to be ready for the AGM, and also efficient, since the accounts have to be presented to the NSW Office of Fair Trading, and there has never been a query about them. Thank you for your many years of service to the Foundation.

And finally, my thanks to each member of the Foundation, and particularly to those on the Council, for all your efforts towards fostering the aims of the Foundation.

Peter Goodwin

Annual General Meeting 2009

The Annual General Meeting was held on 30th November 2009 at the University of Sydney.

The election of office bearers and councillors resulted in no change to the Council. Peter Goodwin, Jenny Jobling, and Ross Smyth-Kirk, who retired by rotation as Councillors, were re-elected unopposed. All of the office bearers were re-elected unopposed as well. The Council is:

President:	Dr Peter Goodwin
Secretary:	Mr Ian Cox
Treasurer:	Dr Jenny Jobling
Vice President:	Professor Richard Williams
Vice President:	Dr E. Charles Morris
Members:	Dr Paddy Lightfoot Dr David Murray Mr Ross Smyth-Kirk Professor Acram Taji

The AGM confirmed the award of grants for three new projects to commence in 2010. Two of these newly funded projects related to climate change.

Dr Amelia Martyn was awarded a grant to study the germination of Australian alpine species and implications in a changing climate. Dr Martyn is Seed Research Officer at Mount Annan Botanic Garden and will conduct germination tests to determine which species are most at risk, and will formulate best-practice germination and storage protocols for revegetation projects for alpine and sub-alpine species. The Australian Native Plant Society Canberra has generously provided a donation of \$5,000 towards the funding of this project.

The other award for climate change research was made to Dr John Morgan of La Trobe University, who will investigate climate change in the Victorian Alps from 1945 to 2009, and the influence of fire, grazing and climate change on plant succession. Dr Morgan is a plant ecologist with 15 years' experience in alpine and temperate ecosystems research. He proposes to database information available from plots established in alpine vegetation on the Bogong High Plains in Victoria, and to analyse the structural and floristic changes that have taken place.

The final award was to Dr Katherine Baker, a Research Associate at Curtin University of Technology Perth, who will investigate the germination requirements of the lesser-known Kangaroo Paws and Catspaws. Dr Baker has studied native seeds since 1998. As many of these lesser-known taxa germinate after fire, heat and smoke treatments will be tested. Some also display characteristics of fire ephemerals such as short life-spans and development of persistent seedbank, so burial trials will be undertaken as these have been shown to alleviate dormancy in other fire ephemerals.



Macropidia fuliginosa -Black Kangaroo Paw
Photo courtesy ANPSA Website and Brian Walters

The AGM also approved Council's suggestion to offer one year's free Foundation membership to new grantees.

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

Measuring and managing the impact of secondary salinisation on riparian flora

Alan Lymbery, Michelle Ingram and Farhan Bokhari
Fish Health Unit, School of Veterinary and Biomedical Sciences, Murdoch University

The secondary salinisation of streams and rivers, largely as a consequence of land clearing, is a major environmental problem in Australia. Although the detrimental effects of salinity on aquatic organisms has been well documented, there is little information on how salinisation affects riparian flora and fauna. Such information is necessary, first to accurately assess species at most risk from salinisation, and second, to identify suitable candidate species for the rehabilitation of riparian zones which have already been affected by salinisation.

We examined the impacts of salinisation on riparian plants and their associated invertebrate fauna in two adjacent catchments, one of which had been partially cleared and the other left uncleared, of the Collie River in the south west of Western Australia. By comparing riparian plant and invertebrate communities between the catchments and also along a salinity gradient within the partially cleared catchment, we were able to determine that increasing soil salinity was associated with a reduction in the diversity of riparian plant species and of plant-dwelling invertebrate species.

The reduction in plant species diversity occurred because of the detrimental effects of salinity on particular plant species. In controlled laboratory trials, we showed that increasing salinity decreased the germination rates of *Bossiaea eriocarpa*, *Hypocalymma angustifolium*, *Hakea lissocarpha*, *Hakea undulata* and *Hakea varia*, all of which were relatively more common in low soil salinities in the catchments, while there was no effect of salinity on the germination rates of *Melaleuca viminea*, *Xanthorrhoea preissii* and *Corymbia calophylla*, which were all relatively more common at high soil salinities.



The reduction in invertebrate species diversity was largely due to fewer species of spiders being found at high soil salinities. We suggest that this occurs because increasing soil salinity leads to a decrease in plant species diversity, which in turn reduces the structural complexity of the habitat for spiders, particularly those species which capture their prey by building webs. This indicates that the effect of salinisation on riparian plants may have consequences which impact on many aspects of the functioning of riparian ecosystems.

The biology and cultivation of *Revwattsia fragile* (Watts) D. L. Jones, a rare Queensland fern, for potential commercial production

D. Christine Cargill^{1, 2} and Jen Johnston¹.

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The rare, endemic fern *Revwattsia fragilis* (Watts) D.L.Jones, is a spectacular plant with fronds growing up to 1–2 m long. The narrow range and limited number of populations of this species, and its vulnerability to habitat disturbance, climate change and collecting predation make it an immediate priority for introduction into horticulture.

The objective of this project was to establish *Revwattsia fragilis* as a viable horticultural commodity by determining the optimum spore germination conditions using sterile media and determining the optimum growth and horticultural conditions. Optimum germination in axenic culture was obtained using either modified Hatcher's medium or modified Moore's medium, solidified with Phytagel.

The *Revwattsia* plants were slow-growing, requiring a number of years and repotting before reaching the stage of producing the large mature fronds found in wild populations. However, the developing juvenile plants are also attractive, and with time, potted juveniles will grow to maturity if correctly nurtured. *Revwattsia* requires good drainage - the optimal growing conditions in the glasshouse were found to be a potting mix of one part decomposed pine bark to one part small pebbles, with regular watering to promote good steady growth.



Figures 15–16. Young plants grown from spores in axenic culture transplanted successfully into pots and grown in a heated glasshouse.

Pollination biology of *Ptilotus axillaris*

Melinda Perkins and Margaret Johnston

Centre for Native Floriculture, School of Land, Crop and Food Sciences, University of Queensland, Gatton



Potted *Ptilotus axillaris* showing trailing plant form and floriferous nature
Photo: Melinda Perkins

Ptilotus axillaris (Amaranthaceae) is a little known Australian species purported to have ornamental potential, however previous breeding attempts have had limited success. Aspects of pollination biology and flowering physiology were investigated to ensure future breeding work employs appropriate strategies for efficient seed production. Seven stages of floral development were characterised. Stages that encompassed anther development, maturation and pollen dehiscence were of longer duration in male-fertile genotypes, however the time between anthesis and flower closure was shorter (compared with male-sterile genotypes).

On the basis of seed set data, no significant difference in stigma receptivity was detected during the 14 day period between anthesis and flower closure. *In vitro* pollen germination showed viable pollen was produced 0 to 2 days following anthesis, suggesting that *P. axillaris* is homogamous. Partial to complete self

incompatibility was observed, with ratios of seed set from self-pollinations to that of cross-pollinations (index of self incompatibility) being 0.27 or lower.

Cultivation under low temperatures (25/10°C day/night) was shown to promote floral initiation. Flower initiation was delayed by high temperatures (35/20°C day/night) but once visible buds were present, flower development was more rapid at high temperatures. However, if plants are maintained continuously under 35/20°C flowering will be suppressed. Flowering is greatly enhanced at 25/10°C, as is plant form. Plants at anthesis had significantly fewer leaves when maintained under long days (16 h photoperiod) compared with short days (11 h photoperiod), suggesting that *P. axillaris* may be a facultative long day plant.

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

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