

## Back from the Brink: Saving Victoria's Threatened Orchids



An entry by the Department of Sustainability and Environment Victoria, Royal Botanic Gardens Melbourne, Australasian Native Orchid Society Victorian group, Parks Victoria, Melbourne Zoo, University of Melbourne, Victoria University and RMIT University, in the *Land and Biodiversity Award* category for the *Banksia Awards 2006*

# **‘Back from the Brink: Saving Victoria’s Threatened Orchids’**

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Bottom: Sunshine Diuris Recovery Team members and community conservation volunteers planting out laboratory-grown seedlings of the Sunshine Diuris *Diuris fragrantissima* in a grassland reserve in Melbourne’s west, to establish a new population of this critically endangered orchid. Photo by Russell Mawson

# Back from the Brink: Saving Victoria's Threatened Orchids

An entry in the 'Land and Biodiversity Award' category for the Banksia Awards 2006

1. **Demonstrate the extent that the project has contributed to the protection and enhancing of land systems, soil and biodiversity in Australia's terrestrial environments.**

## Introduction

Orchids! Mere mention of the word evokes images of flamboyance, brilliant colours, outlandish forms, plus fantastic tales of sexual deception, entrapment, mimicry and complex webs of tangled relationships, and that's just the plants! Add the human dimension – desire, greed, envy, and it is little wonder that no other group of plants evokes such strong passion or entrances the human mind as do orchids.

Orchids constitute the largest group of flowering plants, with an estimated 25–30,000 species distributed world-wide. They are a major component of plant diversity, and a good indicator of overall community diversity and ecosystem health. Australia lacks the diversity of orchids of tropical areas, and has only about 1,500 species. However, what is significant is the diversity of temperate, terrestrial orchids in southern Australia, which is much richer than other comparable temperate areas of the world. Victoria comprises only 3% of the Australian landmass, yet has about 380 species – 25% of the nation's orchids! By comparison, North America has only about 200 species, while Europe has about 250 species, of temperate terrestrial orchids. With such high species diversity, and with over 40% of species endemic to Victoria, the protection and conservation of Victoria's orchids is very important at the national and global level.

## The Challenge

Victoria's wild orchids are imperilled. Since European settlement, at least 11 species have become extinct, while 197 species (about 50%) are considered threatened. Recovering Victoria's threatened orchids is a major challenge.

## The Project

In response to this challenge, the Threatened Orchid Recovery Team (TORT) was established in 1996 to plan and manage a broad-based recovery program to save Victoria's threatened orchids. TORT is a partnership between the Victorian Department of Sustainability and Environment (DSE), Royal Botanic Gardens, Melbourne (RBG), Australasian Native Orchid Society Victorian group (ANOS-Vic), Parks Victoria, Melbourne Zoo, University of Melbourne, Victoria University and RMIT University.

The project aims to save and restore one of the world's great temperate terrestrial orchid floras. It now covers 80 species of the most highly threatened orchids (**Appendix 1**), has protected over 150 populations of 50 threatened orchids, and has increased numbers of four critically endangered orchids (**Appendix 2**), saving them from extinction. Assisting TORT is a broad network of over 40 agencies, community groups and individuals across Victoria, interstate and overseas (**Appendix 3**). The project is quite possibly unique in Australia by virtue of the number of orchids under protection and the number of organisations contributing to their conservation. It is a key project in the protection of Australia's biological diversity, and is designed to

implement biodiversity conservation policies and strategies at the national, State and regional level (**Appendix 6**).

This entry describes the project, its attributes and outcomes in protecting and recovering Victoria's wonderfully rich native orchid flora.

## **2. Demonstrate the significant achievements and results of the project.**

In just ten years, the project has achieved the following substantial and sustainable outcomes:

- The project now covers 80 species of the most highly threatened orchids in Victoria (**Appendix 1**), with more species being added each year.
- Population increases in four Critically Endangered orchids (**Appendix 2**) have, quite literally, saved these species from extinction.
- The protection of over 150 populations of 50 threatened orchids through threat control, fencing, sign-posting, monitoring and negotiation with land owners and managers for protection.
- National Recovery Plans have been adopted or are in preparation for 65 of the most threatened species.
- Action Statements (under the Victorian *Flora and Fauna Guarantee Act 1988*) have been prepared for 47 species.
- Seed of 23 species is in long-term storage for the Victorian Conservation Seedbank.
- 17 species are being cultivated for conservation purposes, including research to further understand biology, especially mycorrhizal associations, as a seed bank, and propagation for reintroduction.
- An outstanding feature is the partnership of over 50 organisations, including 26 community groups, supporting the project (**Appendix 3**). Engaging widespread community support is a key achievement and cornerstone to the project's success.

### **Awards**

The project has been recognised for its achievements, receiving two DSE Reward and Recognition Awards:

- 2003 Statewide winner of the Innovation award, for Orchid Conservation.
- 2004-05 Statewide award for Leadership – development of the International Student Volunteer Program for threatened flora and fauna protection.

## **3. Demonstrate the scale and broader impact of the project.**

From its inception, when only a handful of species were protected, the project now covers 80 species of threatened orchids, including virtually all nationally threatened orchids, across the State. In addition, joint programs are running with agencies in SA and NSW for species that occur across State borders. Over 50 organisations, agencies, and community groups, comprising several hundred people, are contributing to the conservation of Victoria's orchids. Gradual expansion of the project aims to ultimately cover all 190+ threatened orchid species in Victoria.

The project provides a model for other projects involving conservation of many species across a wide area. It demonstrates the effectiveness of a multi-disciplinary approach, with many organisations contributing a wide range of skill and expertise. The devolvement of considerable autonomy and decision-making to the regional and local level facilitates efficient implementation, and a high degree of local ownership of the project.

Much of the information and experience gained during the project has been published, as popular articles, technical reports and scientific papers, and presented at meetings, workshops and conferences (**Appendix 4**). Regular conservation forums and workshops have been organised by the project's major partners. This information covers the range of project issues including organisation, planning, management, research and propagation. Documenting issues, procedures and outcomes exposes the work to independent scrutiny, and makes results widely available to others working on threatened orchid conservation.

#### **4. Demonstrate innovative practices, technologies or standards developed or utilised.**

The sheer size and scale of the effort required to conserve Victoria's wild orchids dictated a major shift from the traditional 'single-species' approach to threatened species conservation, to a broader, multi-species approach. A wide range of skills and expertise from many organisations was required to achieve the project's goal. Excellent working relationships were established with national and international experts in terrestrial orchid ecology and conservation who have contributed to the project (**Appendix 5**). This has provided a valuable external advice and review process, and enabled the rapid adoption of new techniques for orchid conservation in Victoria. The project has set a high standard by the number of partners, especially community groups, supporting orchid conservation.

Specific attention is paid to training agency staff and community volunteers in a wide range of management and research skills, to be able to implement the project on many species across the State. There is also considerable cross-training of participants: field staff are trained in propagation, seed collection and specialist research techniques such as fungal baiting; propagation and research staff participate in field surveys and monitoring; community volunteers participate in the full range of planning, field, laboratory and nursery activities. This not only increases the number of skilled participants, but also helps those involved to better understand the project, their role and the role of others. Community volunteers are actively supported in attendance at workshops, conferences and training days, to maintain and enhance their skills and contribution. **Appendix 7** illustrates a typical progress report from a multi-disciplinary team working together on an aspect of the project.

Orchids are complex organisms that rely on invasion by mycorrhizal fungi for germination and growth, often have very precise habitat requirements, and many have species-specific insect pollinators. Successfully addressing this complex biology and ecology for conservation management required specialist techniques to be developed or adapted from other work. Interstate and international research partners were key to some of this work, and techniques now routinely used in the project include:

- Sterile laboratory methodology for the mass culture of plants for reintroduction.
- Slide baiting for detecting mycorrhizal fungi.
- Hand pollination and seed sowing, collection and storage.
- Micro-habitat manipulation to enhance germination and seedling survival.
- Non-destructive mycorrhizal collar harvesting.
- Collection, storage and inoculation of mycorrhizal fungi for *in vitro* symbiotic germination of orchid seed.
- Investigating mycorrhizal relationships to support reintroduction efforts.
- Field trials of different techniques for managing micro-habitats for orchid conservation.
- Molecular investigation of species taxonomic and population structures to support *in situ* conservation efforts.
- Population viability analysis of monitoring data to evaluate management options.

## 5. Demonstrate how partnerships were formed and utilised and stakeholders engaged in achieving your results.

The project was structured around a small core group of key partners forming TORT, with each partner having a particular area of responsibility and bringing a complementary suite of skills and expertise to the project ie:

- DSE – project management, science, field management.
- RBG – propagation, seed collection & storage, taxonomic & cultivation research.
- Melbourne Zoo – propagation.
- Parks Victoria – land management, community involvement.
- universities – applied research, links to other researchers.
- ANOS-Vic – cultivation, community volunteers for conservation activities.

This was supported by a network of regional recovery teams established across Victoria, involving agency staff, land managers and community groups, with projects developed, owned and implemented at the local level. This aspect has been very successful, with the participation of several local government areas and 26 community groups across the State.

TORT also gained support from several interstate, national and international agencies (**Appendix 3**) including the Australian Orchid Foundation, CSIRO Centre for Plant Biodiversity Research and Kings Park and Botanic Gardens, Perth. Several businesses have made valuable contributions, including Ecology Australia, Portland Aluminium and Western Laboratories.

In addition to the considerable resources provided by project partners, significant funding has been obtained through the Australian Government Natural Heritage Trust. Community group involvement has been assisted by funding from the *Botanic Guardians* scheme, and support provided to attend workshops, conferences and training days. Several PhD scholarships have been funded, which is also important for training scientists in orchid conservation research.

Project partners are kept informed through a range of activities including progress reports, field days, workshops and conferences, all of which help partners see the results for their efforts. The project partners also established the Cooperative Orchid Conservation website ([www.rbg.vic.gov.au/coc/home](http://www.rbg.vic.gov.au/coc/home)), and the Australian Network for Orchid Conservation ([lists.rbg.vic.gov.au/mailman/listinfo/anoc](mailto:lists.rbg.vic.gov.au/mailman/listinfo/anoc)) email list to facilitate communication with others involved in orchid conservation throughout Australia.

## Appendix 1. Threatened orchids under recovery in Victoria

Scientific Name	Common Name	Status
<i>Caladenia amoena</i>	Charming Spider-orchid	e
<i>Caladenia audasii</i>	Audas' Spider-orchid	e
<i>Caladenia calcicola</i>	Limestone Spider-orchid	e
<i>Caladenia</i> species affinity <i>colorata</i> (lower Glenelg River)	Small Western Spider Orchid	e
<i>Caladenia concolor</i>	Crimson Spider-orchid	e
<i>Caladenia</i> species affinity <i>concolor</i> (Midlands)	Midland Spider-orchid	v
<i>Caladenia cruciformis</i>	Red-cross Spider-orchid	e
<i>Caladenia formosa</i>	Elegant Spider-orchid	v
<i>Caladenia fragrantissima</i>	Scented Spider-orchid	e
<i>Caladenia</i> species affinity <i>fragrantissima</i> (Central Vic)	Bendigo Spider-orchid	e
<i>Caladenia</i> species affinity <i>fragrantissima</i> (Inverleigh)	Inverleigh Spider-orchid	e
<i>Caladenia fulva</i>	Tawny Spider-orchid	e
<i>Caladenia hastata</i>	Mellblom's Spider-orchid	e
<i>Caladenia insularis</i>	French Island Spider-orchid	v
<i>Caladenia lowanensis</i>	Mallee Spider-orchid	e
<i>Caladenia maritima</i>	Anglesea Caladenia	e
<i>Caladenia orientalis</i>	Eastern Spider-orchid	e
<i>Caladenia ornata</i>	Ornate Pink Fingers	r
<i>Caladenia pilotensis</i>	Mt Pilot Spider-orchid	e
<i>Caladenia robinsonii</i>	Frankston Spider-orchid	e
<i>Caladenia rosella</i>	Rosella Spider-orchid	e
<i>Caladenia</i> species affinity <i>rosella</i> (Violet Town)	Violet Town Spider-orchid	e
<i>Caladenia tensa</i>	Rigid Spider-orchid	e
<i>Caladenia tessellata</i>	Thick-lip Spider-orchid	e
<i>Caladenia thysanochila</i>	Fringed Spider-orchid	x
<i>Caladenia</i> species affinity <i>venusta</i> (Kilsyth South)	Kilsyth South Spider-orchid	e
<i>Caladenia</i> species affinity <i>venusta</i> (Stuart Mill)	Stuart Mill Spider-orchid	e
<i>Caladenia versicolor</i>	Candy Spider-orchid	e
<i>Caladenia xanthochila</i>	Yellow-lipped Spider-orchid	e
<i>Calochilus richae</i>	Bald-tip Beard-orchid	e
<i>Corunastylis</i> species affinity <i>nudiscapa</i> (Otways)	Otways Midge-orchid	e
<i>Corybas</i> species affinity <i>diemenicus</i> (Coastal)	Late Helmet-orchid	e
<i>Dipodium hamiltonianum</i>	Yellow Hyacinth-orchid	e
<i>Diuris</i> species affinity <i>chryseopsis</i> (Keilor Plains)	Small Golden Moths	v
<i>Diuris dendrobioides</i>	Wedge Diuris	e
<i>Diuris fragrantissima</i>	Sunshine Diuris	e
<i>Diuris ochroma</i>	Pale Golden Moths	e
<i>Diuris pedunculata</i>	Snake Orchid	e
<i>Diuris punctata</i>	Purple Diuris	v
<i>Paracaleana disjuncta</i>	Grampians Duck-orchid	e
<i>Prasophyllum correctum</i>	Gaping Leek-orchid	e
<i>Prasophyllum diversiflorum</i>	Gorae Leek-orchid	e
<i>Prasophyllum</i> species affinity <i>diversiflorum</i> (Orford)	Pretty Leek-orchid	e

<i>Prasophyllum</i> species affinity <i>diversiflorum</i> (north-east)	Lace Leek-orchid	e
<i>Prasophyllum fitzgeraldii</i>	Fitzgerald's Leek-orchid	e
<i>Prasophyllum fosteri</i>	Foster's Leek-orchid	e
<i>Prasophyllum frenchii</i>	Maroon Leek-orchid	e
<i>Prasophyllum</i> species affinity <i>frenchii</i> A	Basalt Leek-orchid	e
<i>Prasophyllum</i> species affinity <i>frenchii</i> B	Summer Leek-orchid	e
<i>Prasophyllum hygrophilum</i>	Swamp Leek-orchid	e
<i>Prasophyllum morganii</i>	Mignonette Leek-orchid	x
<i>Prasophyllum niphopedium</i>	Marsh Leek-orchid	e
<i>Prasophyllum</i> species affinity <i>occidentale</i> C	Clumping Leek-orchid	e
<i>Prasophyllum</i> species affinity <i>pyriforme</i> (Chesney)	Gilgai Leek-orchid	e
<i>Prasophyllum spicatum</i>	Dense Leek-orchid	e
<i>Prasophyllum suaveolens</i>	Fragrant Leek-orchid	e
<i>Prasophyllum subbisetum</i>	Pomonal Leek-orchid	e
<i>Prasophyllum suttonii</i>	Buffalo Leek-orchid	x
<i>Prasophyllum validum</i>	Woodland Leek-orchid	e
<i>Pterostylis basaltica</i>	Basalt Rustyhood	e
<i>Pterostylis</i> species affinity <i>bicolor</i> (Basalt)	Dense Greenhood	e
<i>Pterostylis</i> species affinity <i>bicolor</i> (Sutton Grange)	Sutton Grange Greenhood	e
<i>Pterostylis</i> species affinity <i>boormanii</i> (Beechworth)	Granite Rustyhood	e
<i>Pterostylis cheraphila</i>	Floodplain Rustyhood	v
<i>Pterostylis chlorogramma</i>	Green-striped Greenhood	v
<i>Pterostylis cucullata</i>	Leafy Greenhood	e
<i>Pterostylis</i> species affinity <i>cycnocephala</i> (Woorndoo)	Cygnets Greenhood	e
<i>Pterostylis despectans</i>	Lowly Greenhood	e
<i>Pterostylis</i> species affinity <i>dolichochila</i> (Portland)	Portland Shell-orchid	e
<i>Pterostylis</i> species affinity <i>furcata</i>	Small Sickle Greenhood	e
<i>Pterostylis</i> species affinity <i>mutica</i> (basalt plains)	Leprechaun Greenhood	e
<i>Pterostylis tenuissima</i>	Swamp Greenhood	v
<i>Pterostylis truncata</i>	Brittle Greenhood	e
<i>Pterostylis xerophila</i>	Desert Rustyhood	e
<i>Thelymitra epipactoides</i>	Metallic Sun-orchid	e
<i>Thelymitra gregaria</i>	Basalt Sun-orchid	e
<i>Thelymitra hiemalis</i>	Winter Sun-orchid	e
<i>Thelymitra mackibbinii</i>	Brilliant Sun-orchid	e
<i>Thelymitra matthewsii</i>	Spiral Sun-orchid	v
<i>Thelymitra merraniae</i>	Merran's Sun-orchid	e

**Status:** Conservation Status from 'Advisory List of Rare or Threatened Plants in Victoria – 2005'. Department of Sustainability and Environment, Melbourne.

x = presumed extinct

e = endangered

v = vulnerable

r = rare

## Appendix 2. Threatened Orchids Back from the Brink – Case Studies

### Charming Spider-orchid *Caladenia amoena*

This species naturally occurred in a small area in the outer north-eastern suburbs of Melbourne, from Greensborough to Wattle Glen. Almost all its habitat had been lost to agricultural and urban development. By 1995, only two populations remained, comprising about 45 plants, most in one declining population on two adjoining private properties, and about five in a second population on crown land. Successful negotiations with one land owner to protect most of the population, and activities including predator and weed control, hand pollination, seed sowing and micro-habitat manipulation to enhance seedling establishment, resulted in the population increasing to about 100 plants by 2005. Protection and threat control at the second site has increased the population there to 13 plants. During 2004, 13 plants were removed from the largest population and transplanted to a new site to establish a third population. All plants survived and established, and flowers were hand-pollinated and seed sown at the site. In 2005, 20 new seedlings emerged, increasing the population to 33 plants. There are now three protected populations comprising about 160 plants, and numbers at all sites are continuing to increase.



Group of Charming Spider-orchids transplanted to start a new population. From 13 plants, this population has increased to 33 plants.



Mellbloms Spider-orchid *Caladenia hastata*

Mellbloms Spider-orchid is naturally restricted to a small area in south-western Victoria. In 1997 there were just 10 plants remaining in two locations in the wild, and a few plants in cultivation. Intensive work in the field including site protection, weed and predator control, hand-pollination, seed sowing, micro-habitat manipulation, and ecological burning of its heathland habitat, plus laboratory propagation and reintroductions, has increased numbers to 720 plants in five populations, in 2005. In addition, publicity about the project lead to the discovery by a community conservation group of a new population of about 70 plants. With about 800 plants now in six populations, the prospects for long-term recovery of this spectacular orchid are excellent.



Part of a group of about 35 flowering plants of Mellblom's Spider-orchid in the main population at Portland, Nov. 2004. Sights such as this have not been seen in south-western Victoria for several decades.

Rosella Spider-orchid *Caladenia rosella*

The Rosella Spider-orchid was formerly widespread in dry woodlands throughout central Victoria and southern New South Wales. By the 1980s it had declined to just five populations totalling about 30 plants, all in the outer north-eastern suburbs of Melbourne, and all under threat from spreading urban development. Intensive field work including threat control, hand-pollination and seed sowing has resulted in the main population, at Cottlesbridge, increasing from just 20 plants in the mid-1990s, to 270 in 2004. Another population, at Christmas Hills, had declined to two plants in 1993, but similar protecting work there has increased to 35 plants in 2005. Successful experimental techniques developed and used to increase numbers of this species in the wild, especially micro-habitat management, are now applied routinely to many other populations of threatened orchids across Victoria.



Rosella Spider-orchids in the population at Christmas Hills. From a low of just two plants, this population is steadily increasing, in response to protection and habitat management.



Sunshine Diuris *Diuris fragrantissima*

The Sunshine Diuris is probably Victoria's most famous threatened orchid, and the subject of recovery attempts for more than 50 years. Once abundant on the basalt plains to the west of Melbourne, the species had declined to just five populations by 1970, and by 1980 the species was restricted to a single remaining site, where about 100 plants survived. This population continued to decline, until only about five plants survived by the mid-1990s. A few plants survived in cultivation, which provided the basis for a sustained propagation effort to increase plant numbers. Intensive site management and reintroductions resulted in a wild population increase to about 30 plants in 2005. During 2004 and 2005, 700 plants from laboratory-produced seedlings were reintroduced to a second wild site in a secure grassland reserve. In spring 2005, over 120 of these translocated plants flowered. More plants are being cultivated for additional reintroductions, and further reintroductions are planned.



Monitoring and hand-pollination of Sunshine Diuris at the last remaining wild population, Nov. 2005  
Appendix 2 photographs by Gary Backhouse

## **Appendix 3. Organisations Saving Victoria's Threatened Orchids**

### **Principle Partners**

Department of Sustainability and Environment  
Australasian Native Orchid Society (Victorian Group) – community group  
Melbourne Zoo  
Parks Victoria  
RMIT University  
Royal Botanic Gardens, Melbourne  
University of Melbourne  
Victoria University

### **Support Organisations**

Australian Orchid Foundation  
CSIRO Centre for Plant Biodiversity Research – Australian National Herbarium  
Kings Park and Botanic Gardens, Perth  
Research School of Biological Sciences, Australian National University  
University of Puerto Rico  
University of Western Australia

### **Community Groups**

ANGAIR (Anglesea, Aireys Inlet Society for the Protection of Flora and Fauna)  
Australasian Native Orchid Society (Geelong Group)  
Australian Plants Society (APS) Wimmera Group  
APS Warrnambool Group  
APS Wangaratta Group  
Dunmoochin Landcare Group  
Field Naturalist Club of Victoria (FNCV) Botany Group  
FNCV Bairnsdale Group  
FNCV Bendigo Group  
FNCV Casterton Group  
FNCV Hamilton Group  
FNCV Portland Group  
FNCV Stawell Group  
FNCV Timboon Group  
Friends of Angahook-Lorne State Park  
Friends of Betty Clift Conservation Reserve  
Friends of Chiltern-Mt Pilot National Park  
Friends of the Cobberas (Alpine National Park)  
Friends of Inverleigh Flora and Fauna Reserve  
Friends of Kiata Flora Reserve  
Friends of Mt Eliza Regional Park  
Friends of Wonthaggi Heathlands  
Gerang Landcare Group  
Point Danger Committee of Management  
Southern Peninsula Indigenous Flora & Fauna Association

### **Local government**

City of Brimbank  
City of Greater Bendigo  
City of Wyndham  
Shire of Mornington Peninsula  
Shire of Moyne  
Shire of Nillumbik

**Catchment Management Authorities**

Corangamite CMA  
Glenelg Hopkins CMA  
North Central CMA

**Business**

Ecology Australia, Melbourne  
Portland Aluminium (Alcoa Australia)  
Western Laboratories, South Australia

## Appendix 4. Publications List – Saving Victoria’s Threatened Orchids

### Journal publications

- Backhouse, G. and Cameron, D. 2005. Application of IUCN 2001 Red List categories in determining the conservation status of the native orchids of Victoria, Australia. *Selbyana* 26(1,2): 58–74.
- Duncan, M., Pritchard, A. and Coates, F. Major threats to endangered orchids in Victoria, Australia. *Selbyana* 26(1,2): 189–195.
- Marshall, D., Pritchard, A. and Duncan, M. 2005. The success of government-community partnerships in orchid conservation in Victoria, Australia. *Selbyana* 26(1,2): 293–298.
- Smith, Z.F., Murphy, D.J., James, E.A. and McClean, C.B. 2005. Molecular investigation of the *Diuris punctata* group in south-eastern Australia. *Selbyana* 26(1,2): 217–228.
- Smith, Z.F., James, E.A. and McLean, C.B. 2005. Investigation of the phylogenetic relationships between *Diuris fragrantissima* and its closest relatives using AFLPs. *The Environmentalist* in press.
- Wright, M., Guest, D. and Cross, R. 2005. Development of mycorrhizal associations in *Caladenia tentaculata*. *Selbyana* 26(1,2): 114–124.

### Scientific congress abstracts

#### First International Orchid Conservation Congress, Perth WA, September 2001.

- Backhouse, G.N., Coates, F. and Todd, J. An overview of the conservation status of the native orchids of Victoria.
- Coates, F. and Lunt, I. Patterns of appearance and transition to flowering in *Prasophyllum correctum* D.L. Jones, a threatened orchid from south-eastern Australia.
- Dash, A. The role of the Australasian Native Orchid Society Inc. in orchid conservation.
- Govanstone, A., Hill, J. and Pritchard, A. Mellblom’s Spider-orchid *Caladenia hastata* – managing the *in situ* recovery of a critically endangered spider-orchid.
- Huynh, T., McLean, C.B. and Lawrie, A. Seasonal observation of the endangered terrestrial spider orchid *Caladenia formosa* G.W. Carr.
- Knight, C., James, E. and Akiyama, S. 2001. Reversing the decline of *Diuris fragrantissima*.
- Lawrie, A., Huynh, T., Raleigh, R., McLean, C.B. Cross, R.G., Coates, F. and Moorrees, A.C.A. Molecular biology of mycorrhizal fungi from Australian terrestrial orchids.
- Raleigh, R., Cross, R.G., Lawrie, A.C., Coates, F. and Moorrees, A.C.A. Research into the propagation of eastern Australian spider-orchids *Caladenia*.
- Richards, H. The Australian Orchid Foundation and conservation.
- Wright, M., Guest, D. and Cross, R. The development of mycorrhizal infection in *Caladenia tentaculata*.

#### Mutual Gains: Co-operative Orchid Conservation in south-eastern Australia

16<sup>th</sup>–18<sup>th</sup> October 2002. Royal Botanic Gardens, Melbourne

For a full list of Abstracts, go to <http://www.rbq.vic.gov.au/static/archive/mutualgains/>

#### Orchid Conservation Forum II

25<sup>th</sup>–27<sup>th</sup> September, 2003. Royal Botanic Gardens, Melbourne

For a full list of Abstracts, go to <http://www.rbg.vic.gov.au/static/archive/orchidforum/>

### **Published Recovery Plans**

- Backhouse, G., Bramwells, H., Musker, R., Walker, G. and Lester, K. 1999. Frankston Spider Orchid (*Caladenia robinsonii* G.W.Carr) Recovery Plan 1999–2003. Department of Natural Resources and Environment, Victoria.
- Backhouse, G., Webster, A. and Arnott, J. 2000. Sunshine Diuris (*Diuris fragrantissima*) (Orchidaceae: Diuridinae) Recovery Plan 1998–2002. Department of Natural Resources and Environment, Victoria.
- Berwick, S., Moorrees, A. and Coates, F. 2000. Recovery Plan for the Bald-tip Beard Orchid (*Calochilus richiae* Nicholls). Department of Natural Resources and Environment, Victoria.
- Coates, F., Jeanes, J. and Pritchard, A. 2002. Recovery plan for twenty-five threatened orchid taxa of Victoria, South Australia and New South Wales 2003–2007. Department of Sustainability and Environment, Melbourne.
- Ingeme, Y. and Backhouse, G. 199. Basalt Greenhood (*Pterostylis basaltica*) Recovery Plan 2000–2004. Department of Natural Resources and Environment, Victoria.
- Ingeme, Y. and Govanstone, A. 1999. Gorae Leek Orchid (*Prasophyllum diversiflorum*) (Orchidaceae) Recovery Plan 2000–2004. Department of Natural Resources and Environment, Victoria.
- Todd, J.A. 2000. Recovery Plan for twelve threatened spider-orchid *Caladenia* R. Br. taxa of Victoria and South Australia 2000–2004. Department of Natural Resources and Environment, Victoria.

### **Draft Recovery Plans**

- Duncan, M., Pritchard, A. and Todd, J. (in press). Recovery Plan for Twelve Threatened Spider Orchids (*Caladenia* R. Br.) in Victoria and South Australia. Department of Sustainability and Environment, Victoria.
- Duncan, M., Pritchard, A. and Coates, F. (in press). Recovery Plan for Fifteen Threatened Orchids in Victoria and South Australia. Department of Sustainability and Environment, Victoria.
- Duncan, M. (in prep.) National Recovery Plan for the Small Western Spider-orchid *Caladenia* sp. aff. *colorata*. Department of Sustainability and Environment, Victoria.
- Duncan, M. (in prep.) National Recovery Plan for the Thick-lipped Spider-orchid *Caladenia tessellata*. Department of Sustainability and Environment, Victoria.
- Duncan, M. (in prep.) National Recovery Plan for the Dense Leek Orchid *Prasophyllum spicatum*. Department of Sustainability and Environment, Victoria.
- Duncan, M. (in prep.) National Recovery Plan for the Maroon Leek Orchid *Prasophyllum frenchii*. Department of Sustainability and Environment, Victoria.
- Duncan, M. (in prep.) National Recovery Plan for the Woodland Leek Orchid *Prasophyllum validum*. Department of Sustainability and Environment, Victoria.
- Duncan, M. (in prep.) National Recovery Plan for the Enigmatic Greenhood *Pterostylis aenigma*. Department of Sustainability and Environment, Victoria.
- Duncan, M. (in prep.) National Recovery Plan for the Desert Greenhood *Pterostylis xerophila*. Department of Sustainability and Environment, Victoria.

- Duncan, M. (in prep.) National Recovery Plan for the Spiral Sun-orchid *Thelymitra matthesii*. Department of Sustainability and Environment, Victoria.
- Pritchard, A. (in prep.) National Recovery Plan for three species of threatened orchids in south-eastern South Australia and south-western Victoria: *Caladenia richardsiorum* (Little Dip Spider-orchid), *Caladenia calcicola* (Limestone Spider-orchid) and *Pterostylis tenuissima* (Swamp Greenhood). Department of Environment and Heritage, South Australia and Department of Sustainability and Environment, Victoria.

### **Other reports**

- Coates, F. 2001. Patterns of appearance and response to management of *Prasophyllum correctum* D.L. Jones at Munro, Victoria. Department of Natural Resources and Environment, East Melbourne.
- James, E. A., Orthia, L. and Garrick, R. 2002. Conservation genetics of *Prasophyllum correctum* in Victoria and Tasmania. Royal Botanic Gardens, South Yarra.
- James, E. A., Garrick, R. and Orthia, L. 2002. Conservation genetics of *Prasophyllum diversiflorum* in southwest Victoria. Royal Botanic Gardens, South Yarra.
- Victorian Threatened Orchid Recovery Team 2004. *Ex situ* cultivation Guidelines for the Sunshine Diuris, *Diuris fragrantissima*. Department of Natural Resources and Environment, Melbourne.
- Victorian Threatened Orchid Recovery Team 2004. *Ex situ* cultivation Guidelines for the Small Golden Moths, *Diuris* sp. aff. *chryseopsis*. Department of Natural Resources and Environment, Melbourne.
- Victorian Threatened Orchid Recovery Team 2004. Cultivation techniques for the Conservation of Temperate Australian Terrestrial Orchids. Department of Natural Resources and Environment, Melbourne.
- Victorian Threatened Orchid Recovery Team 2005. General guidelines for nurseries growing terrestrial orchids for conservation use. Royal Botanic Gardens, Melbourne.

## Appendix 5. Interstate, National and International Contributors

The project relies on the contribution of skills and expertise from a network of national and international experts on orchids, who have provided advice, direction and review. These include:

- Dr Mark Clements and Mr David Jones, CSIRO Centre for Plant Biodiversity Research. Foremost taxonomic authorities on Australian orchids, also biology, conservation status.
- Dr Kingsley Dixon and Dr Andrew Batty, Kings Park and Botanic Gardens, Perth. Propagation (especially laboratory micro-propagation), reintroduction, biology and ecology of terrestrial orchids.
- Dr Colin Bower, formerly NSW Dept Primary Industries. Orchid-pollinator biology and ecology.
- Professor Raymond Tremblay, University of Puerto Rico; Chair, *In-situ* Conservation Committee, Orchid Specialist Group, IUCN. International authority on orchid population viability. Professor Tremblay completed a six-month sabbatical in Victoria in 2005, hosted by the Royal Botanic Gardens, Melbourne, during which he conducted training workshops in orchid population viability analysis, assisted Victorian researchers with data analysis, and undertook several research projects on terrestrial orchid population dynamics in Victoria.
- Professor Marilyn Light (University of Ottawa, Canada and Chair, North American Region Orchid Specialist Group, IUCN). Biology of terrestrial orchids, community group involvement in orchid conservation.

## Appendix 6. Policy basis for the Project

The Project is designed to implement national, State and regional NRM policies and strategies for biodiversity conservation, including:

### *National*

Environment Protection and Biodiversity Conservation Act 1999. The EPBC Act promotes the conservation of biodiversity by providing strong protection for threatened species and ecological communities, migratory, marine and other protected species.

National Strategy for the Conservation of Australia's Biological Diversity: To enable Australia's species and ecological communities threatened with extinction to survive and thrive in their natural habitats and to retain their genetic diversity and potential for evolutionary development, and prevent additional species and ecological communities from becoming threatened

Conservation of Australian Species and Communities Threatened with Extinction – A National Strategy

National Objectives and Targets for Biodiversity Conservation – Protecting Threatened Species and Ecological Communities

### *State*

Flora and Fauna Guarantee Act 1988. To guarantee that all taxa of Victoria's flora and fauna can survive, flourish and retain their potential for evolutionary development in the wild; to conserve Victoria's communities of flora and fauna; to encourage the conserving of flora and fauna through co-operative community endeavours.

Victoria's Biodiversity – Directions in Management: there is an increase in the viability of threatened species and in the extent and quality of threatened ecological communities.

Royal Botanic Gardens Victorian Conservation Seedbank: A Victorian seed bank project in partnership with the Millennium Seed Bank. It will collect seed of Victoria's nearly 400 endemic plant species and other species of high-priority because of their vulnerability to extinction or their critical value to threatened communities. Orchids are a high priority because of the level of endemism and the high number of threatened species.

### *Regional*

Catchment Management Authority Regional Catchment Strategies and Regional Catchment Investment Plans: The 10 CMAs in Victoria all have an RCS that includes biodiversity conservation targets, including targets for threatened species and communities.

Biodiversity Action Planning: a structured approach to identifying priorities and mapping significant areas for native biodiversity conservation at the landscape and 'bioregional' scale (see [www.dse.vic.gov.au](http://www.dse.vic.gov.au)).

## Appendix 7. Example of progress report from multi-disciplinary project team

### **Orchid Conservation:**

#### **Quarterly Progress Report for the Department of Sustainability and Environment Recovery Plan Implementation - Threatened Orchid Cultivation 2004-2005**

This project addresses actions required to implement recovery plans for the following species:

*Caladenia amoena*, *C. audasii*, *C. concolor*, *C. cruciformis*, *C. formosa*, *C. fragrantissima*, *C. hastata*, *C. lowanensis*, *C. pilotensis*, *C. rosella*, *C. sp. aff. venusta* (Stuart Mill), *C. xanthochila*, *Calochilus richiae*, *C. roberstonii* (to establish techniques for *Calochilus richiae*), *Corunastylis nudiscapa* (for *C. sp. aff. nudiscapa* (Otway Ranges)), *C. sp. aff. nudiscapa* (Otway Ranges), *Diuris sp. aff. chryseopsis*, *D. fragrantissima*, *Paracaleana disjuncta*, *P. minor* (for *P. disjuncta*), *Prasophyllum correctum*, *P. diversiflorum*, *P. sp. aff. fitzgeraldii* A, *P. fosteri*, *P. hygrophilum*, *P. morganii*, *P. niphopedium*, *P. sp. aff. frenchii* 2, *P. sp. aff. frenchii* B, *P. suaveolens*, *P. subbisetum*, *P. suttonii*, *Pterostylis basaltica*, *P. despectans*, *Thelymitra epipactoides*, *T. mackibbinii*.

#### **Report prepared by:**

Zoë Smith & Magali Wright  
Orchid Research Officers

Dick Thomson  
Orchid Research Volunteer

Rob Cross  
Horticultural Botanist

#### **Report No. 6: July to December 2005**

A summary of tasks completed are listed in the following tables:

<b>Tasks</b>	<b>Summary of work</b>
<i>Task 1: Propagation and cultivation</i>	
Prepare an inventory of all plant, seed and fungal material currently held at the RBG	<p>Stocktake of seed, fungi and nursery plants: seed inventory updated by 15.6.04; fungi inventory updated 22.6.04 and fungi in water storage has been completed with inventory of fungi on plates continuing. Seed inventory updated 5.12.05 along with expansion of seed storage space.</p> <p>Record sheets documenting fungal isolation, seed germination and deflasking of each species have been continued.</p> <p>A formal database is being developed to document all orchid research, including stock management. This database will be incorporated with the Royal Botanic Gardens Living Collections database. This database will make documenting and retrieving research data faster and easier and will allow labels and reports to be generated quickly and accurately.</p> <p>Methods have been updated and optimised</p>
Re-culture existing fungal collections and store under water ( <i>Caladenia amoena</i> , <i>C. robinsonii</i> , <i>C. rosella</i> , <i>C. versicolor</i> , <i>C. hastata</i> , <i>C. fragrantissima</i> subsp. <i>orientalis</i> )	<p><b>Fungi re-cultured from existing collections.</b></p> <p>Fungi from the following species have been</p>

re-cultured:

*Caladenia amoena*  
*C. dendrobioides*  
*C. fragrantissima* subsp. *orientalis*  
*C. fulva*  
*C. formosa*  
*C. hastata*  
*C. lowanensis*  
*C. pilotensis*  
*C. robinsonii*  
*C. rosella*  
*C. tensa*  
*C. xanthochila*  
*Diuris* sp. aff. *chryseopsis* (Burns Rd)  
*Diuris fragrantissima*  
*Pterostylis basaltica*

Fungi from the following species have been re-cultured from water storage:

*Caladenia amoena*  
*C. fragrantissima* subsp. *orientalis*  
*C. fulva*  
*C. robinsonii*  
*C. rosella*  
*C. tensa*  
*C. venusta*  
*Prasophyllum correctum*  
*P. diversiflorum*

**Long-term storage of fungi under water.**

Fungi from the following orchids have been stored under water:

*Caladenia fulva* (including new isolates)  
*C. formosa* (including new isolates)  
*C. xanthochila*  
*C. hastata* (including new isolates)  
*C. cruciformis*  
*C. fragrantissima* subsp. *orientalis* (including new isolates)  
*C. lowanensis* (including new isolates)  
*C. oenochila*  
*C. parva*  
*C. dilitata*  
*C. deformis*  
*C. latifolia*  
*C. clavigera*  
*C. pilotensis*  
*C. rosella*  
*C. robinsonii*  
*C. venusta*  
*C. sp.aff. venusta*  
*C. versicolor* (new isolates only)  
*Diuris* sp. aff. *chryseopsis* (including new isolates)  
*D. fragrantissima*  
*D. punctata*  
*Glossodia major*  
*Prasophyllum diversiflorum*  
*P. odoratum*  
*Pterostylis basaltica*  
*P. sp. aff. cycnocephala*

	<i>P. despectans</i>
<p>Prepare or source and store fungal cultures (<i>Caladenia concolor</i>, <i>C. cruciformis</i>, <i>C. formosa</i>, <i>C. fragrantissima</i>, <i>C. lowanensis</i>, <i>C. pilotensis</i>, <i>C. sp. aff. venusta</i> (Stuart Mill), <i>C. xanthochila</i>, <i>Calochilus richiae</i>, <i>Diuris sp. aff. chryseopsis</i>, <i>Paracaleana minor</i> (for <i>P. disjuncta</i>), <i>Prasophyllum diversiflorum</i>, <i>P. suaveolens</i>, <i>Pterostylis basaltica</i>, <i>P. despectans</i>, <i>Thelymitra epipactoides</i>, <i>T. mackibbinii</i>)</p>	<p><b>Re-cultured fungi.</b> Fungi re-cultured from storage include: <i>Caladenia hastata</i> R38 and R37 <i>C. robinsonii</i> 1994 <i>C. hastata</i> R37 didn't grow. R38 germinated seed in low quantities (~20%). <i>C. robinsonii</i> 1994 successfully germinated seed (~50-70%)</p> <p><b>Newly isolated fungi.</b> Fungi isolated from: <i>Caladenia audassii</i> <i>C. sp. aff. fragrantissima</i> <i>C. sp. aff. venusta</i> <i>Caleana major</i> Langwarrin <i>Diuris dendrobioides</i>, nursery collection, fungi potentially from site soil that asymbiotic plants were deflasked into. <i>Diuris fragrantissima</i> Sunshine <i>Paracaleana minor</i> <i>Prasophyllum diversiflorum</i> <i>Pterostylis sp. aff. bicolor</i> <i>Thelymitra pauciflora</i> <i>T. mackibbinii</i> <i>T. rubra</i></p>
<p>Using germination trials, retest stored fungi and re-isolate where appropriate.</p>	<p><b>Germination trials with stored fungi:</b></p> <p><b>Effective germination:</b> <i>Caladenia sp. aff. venusta</i> <i>C. amoena</i> <i>C. versicolor</i> <i>C. robinsonii</i> <i>C. hastata</i> <i>C. fulva</i> <i>C. fragrantissima</i> subsp. <i>orientalis</i> <i>Pterostylis despectans</i>, 7 fungal isolates <i>P. basaltica</i>, Warcup's fungi <i>P. sp. aff. cycnocephala</i>, Warcup's fungi</p> <p><b>Inconclusive germination (too early):</b> <i>Caladenia formosa</i></p> <p><b>Untested fungi (no germination trial yet):</b> We have fungi for <i>Prasophyllum correctum</i> and <i>Caladenia tensa</i> although no seed.</p> <p><b>Germination trials with newly isolated fungi:</b></p> <p><b>Effective germination:</b> <i>Caladenia audasii</i> <i>Caladenia sp. aff. fragrantissima</i> (low germination, maybe due to failure in controlled environment cabinet) <i>Diuris dendrobioides</i>, fungi from plants in nursery (potentially from site soil) <i>Thelymitra mackibbinii</i> fungi has germinated seed of <i>T. flexuosa</i>, <i>T. pauciflora</i> and <i>T. rubra</i>.</p>

	<p>No <i>T. mackibbinii</i> seed is available for testing</p> <p><b>Inconclusive germination (too early):</b>  <i>Caladenia</i> sp. aff. <i>venusta</i> Dalynong Bush Reserve  <i>Diuris fragrantissima</i> Sunshine  <i>Diuris</i> sp. aff. <i>chryseopsis</i> Rockbank</p> <p><b>Unsuccessful germination:</b></p>
As standard practice, isolate fungi from protocorms of the above initiated in the laboratory or in field baiting trials.	<p>Yet to be completed – material not available yet.</p> <p>Seed baits were made for the following species:</p> <p><i>Caladenia fragrantissima</i> subsp. <i>orientalis</i>  <i>Caladenia robinsonii</i>  <i>Prasophyllum frenchii</i></p>
Store threatened orchid seed under appropriate conditions, according to availability (In particular: <i>Caladenia amoena</i> , <i>C. audasii</i> , <i>C. concolor</i> , <i>C. cruciformis</i> , <i>C. formosa</i> , <i>C. fragrantissima</i> , <i>C. hastata</i> , <i>C. lowanensis</i> , <i>C. pilotensis</i> , <i>C. rosella</i> , <i>C. sp. aff. venusta</i> (Stuart Mill), <i>C. xanthochila</i> , <i>Calochilus richiae</i> , <i>Corunastylis</i> sp. aff. <i>nudiscapa</i> (Otway Ranges), <i>C. nudiscapa</i> (for <i>C. sp. aff. nudiscapa</i> (Otway Ranges)), <i>Diuris</i> sp. aff. <i>chryseopsis</i> , <i>D. fragrantissima</i> , <i>Paracaleana disjuncta</i> , <i>Prasophyllum correctum</i> , <i>P. diversiflorum</i> , <i>P. fitzgeraldii</i> , <i>P. fosteri</i> , <i>P. hygrophilum</i> , <i>P. morgani</i> , <i>P. niphopedium</i> , <i>P. sp. aff. frenchii</i> 2, <i>P. sp. aff. frenchii</i> B, <i>P. suaveolens</i> , <i>P. subbisectum</i> , <i>P. suttonii</i> , <i>Pterostylis basaltica</i> , <i>Thelymitra mackibbinii</i> , <i>T. epipactoides</i> )	<p>Seed of the following species has been stored:</p> <p>Seed collection kits inaugurated, for efficiency and uniformity in seed collection and storage. Seed storage area has been enlarged to fit increased number of seed packets.</p>
Establish seedlings ( <i>Caladenia concolor</i> , <i>C. cruciformis</i> , <i>C. formosa</i> , <i>C. fragrantissima</i> , <i>C. lowanensis</i> , <i>C. pilotensis</i> , <i>C. sp. aff. venusta</i> (Stuart Mill), <i>C. versicolor</i> , <i>C. xanthochila</i> , <i>Calochilus roberstonii</i> (to establish techniques for <i>Calochilus richiae</i> ), <i>Paracaleana minor</i> (for <i>P. disjuncta</i> ), <i>Prasophyllum correctum</i> , <i>P. diversiflorum</i> , <i>P. suaveolens</i> , <i>Pterostylis basaltica</i> , <i>Thelymitra mackibbinii</i> , <i>T. epipactoides</i> ). Preliminary work to be done on non-threatened species where appropriate.	<p><b>Seedlings transferred to sponge in tissue culture tubes</b></p> <p><i>Caladenia xanthochila</i>: 32 jars x3 seedlings  <i>C. hastata</i>: 20 jars x 3 seedlings  <i>C. pilotensis</i>: 5 jars x 2 seedlings  <i>Pterostylis basaltica</i>: 23 jars x 5 seedlings  <i>P. despectans</i>: 18 jars x 5 seedlings  <i>Thelymitra rubra</i>: 9 jars x 5 seedlings  <i>C. amoena</i>: 10 jars x3 seedlings  <i>C. audasii</i>: 5 jars x3 seedlings  <i>C. robinsonii</i>: 2 jars x3 seedlings  <i>C. sp. aff. fragrantissima</i>: 1 jars x 3 seedlings</p> <p>Maintenance of plants in tissue culture tubes, eg. keeping the media hydrated and removing contaminants.</p> <p>New methods for transferring seedlings from petri dish to nursery are being investigated, including methods from Kings Park as an alternative to sponge technique.</p>
Arrange asymbiotic cultivation trials for <i>C. audasii</i> with K. Western when seed available.	Do we still need to do this, now that a symbiotic fungus has been isolated?
Maintain and increase existing plant collections	Collections maintained

<i>(C. rosella, D. sp. aff. chryseopsis)</i>																																																	
De-flask seedlings from germination trials into hyko trays or other containers suitable for transferring seedlings to the field and manage in RBG orchid house	<p>Seedlings micropropagated in December 2005 and early 2006 on mass for deflasking in Autumn 2006.</p> <p><i>Diuris dendrobioides</i> seedlings, propagated asymbiotically by Kevin Western, were deflasked in December into potting mix, with some site soil around the tubers. Approximately 100 seedlings were reintroduced in September 2005, with ~60 % survival rate after two months.</p> <p><b>Seedlings deflasked and maintained in nursery:</b></p> <table border="1" data-bbox="900 613 1422 1137"> <thead> <tr> <th></th> <th>Deflasked</th> <th>Surviving (estimate)</th> </tr> </thead> <tbody> <tr><td><i>Caladenia amoena</i>:</td><td>55</td><td>10</td></tr> <tr><td><i>C. calcicola</i></td><td>105</td><td>50</td></tr> <tr><td><i>C. concolor</i></td><td>40</td><td>10</td></tr> <tr><td><i>C. cruciformis</i></td><td>725</td><td>150</td></tr> <tr><td><i>C. formosa</i></td><td>59</td><td>10</td></tr> <tr><td><i>C. fulva</i></td><td>49</td><td>10</td></tr> <tr><td><i>C. hastata</i></td><td>42</td><td>10</td></tr> <tr><td><i>C. pilotensis</i></td><td>5</td><td>0</td></tr> <tr><td><i>C. robinsonii</i></td><td>84</td><td>20</td></tr> <tr><td><i>C. rosella</i></td><td>90</td><td>20</td></tr> <tr><td><i>C. versicolor</i></td><td>157</td><td>70</td></tr> <tr><td><i>C. xanthochila</i></td><td>180</td><td>70</td></tr> <tr><td><i>Diuris fragrantissima</i></td><td>1400</td><td>300</td></tr> <tr><td><i>D. sp. aff. chryseopsis</i></td><td>114</td><td>10</td></tr> <tr><td><i>Pterostylis basaltica</i></td><td>110</td><td>60</td></tr> </tbody> </table> <p>NOTE: Solid data will be available upon re-emergence in 2006.</p> <p>Nursery area maintained and kept clean, seedlings monitored for watering regimes. Accession forms prepared for collections.</p>		Deflasked	Surviving (estimate)	<i>Caladenia amoena</i> :	55	10	<i>C. calcicola</i>	105	50	<i>C. concolor</i>	40	10	<i>C. cruciformis</i>	725	150	<i>C. formosa</i>	59	10	<i>C. fulva</i>	49	10	<i>C. hastata</i>	42	10	<i>C. pilotensis</i>	5	0	<i>C. robinsonii</i>	84	20	<i>C. rosella</i>	90	20	<i>C. versicolor</i>	157	70	<i>C. xanthochila</i>	180	70	<i>Diuris fragrantissima</i>	1400	300	<i>D. sp. aff. chryseopsis</i>	114	10	<i>Pterostylis basaltica</i>	110	60
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<b>Key Outcomes:</b> Increased seed and fungi bank; increased <i>ex situ</i> collection of threatened orchids.																																																	

<b>Task 2. Develop fungal inoculation method</b>	
Prepare material for fungal inoculation & baiting trials using sterilised millet ( <i>C. hastata</i> , <i>C. sp. aff. venusta</i> (Stuart Mill) and other species as required)	<p>Millet has been inoculated with fungi from the following host species:</p> <ul style="list-style-type: none"> <li><i>C. amoena</i></li> <li><i>C. audassii</i></li> <li><i>C. concolor</i></li> <li><i>C. hastata</i></li> <li><i>C. pilotensis</i></li> <li><i>C. robinsonii</i></li> <li><i>C. xanthochila</i></li> <li><i>C. sp. aff. fragrantissima</i></li> </ul> <p>Germination trials have confirmed that all inoculated millet has the ability to germinate seed of the appropriate species.</p>
<b>Key Outcomes:</b> Methods improved; millet fungal cultures supplied	

<i>Task 3. Investigate cryostorage</i>	
Develop recommendations for determining seed viability for orchid seeds	To be done
Investigate requirements for a cryostorage facility for orchid seed and orchid mycorrhizal fungi	Updated quotes currently requested.
Develop protocols for seed and fungi preparation for storage at 4°C and cryogenically.	To be done Long term fungal storage trials have begun, with isolates stored at room temperature, 4 degrees, and -80 degrees, and under water. To be assessed after a period of storage.
If funding available purchase equipment and cryogenically store orchid seed and fungi	To be done
<b>Key Outcomes:</b> Recommendations and protocols developed, requirements and costs determined	

<i>Task 4. Maintain committees</i>	
Facilitate TORT Cultivation Committee meetings as appropriate	The TORT Cultivation Committee met on 20 Dec 2005.
Facilitate Orchid Researchers Group meetings as appropriate	Program to be worked out for 2006
Communication of research with the broader community	The Co-operative Orchid Conservation website now public, advertising through ANOC and communicating with researchers to develop Nation-wide contacts and connections.
<b>Key Outcomes:</b> Communication of current and planned research activities between orchid researchers, orchid enthusiasts, growers and recovery team members.	

<i>Task 5. Reporting and record keeping</i>	
Provide quarterly reports on project progress against tasks	Reports provided October 2004 (September quarter), January 2005 (December quarter) May 2005 (March quarter), June quarter including annual report, and combined September and December quarters 2005 report (provided in February 2006).
Incorporate records of stored seed, fungi, seedlings and potted plants in existing databases.	Records incorporated into databases
<b>Key Outcome:</b> four progress reports and one final report; database of all material held at RBG relevant to the implementation of recovery plans for threatened orchids supplied to Statewide Coordinator. Maintain a database of all material held at RBG relevant to the implementation of recovery plans for threatened orchids	