National Recovery Plan for the Bald-tip Beard Orchid *Calochilus richiae*

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Australian Government



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This is a Recovery Plan prepared under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*, with the assistance of funding provided by the Australian Government.

This Recovery Plan has been developed with the involvement and cooperation of a range of stakeholders, but individual stakeholders have not necessarily committed to undertaking specific actions. The attainment of objectives and the provision of funds may be subject to budgetary and other constraints affecting the parties involved. Proposed actions may be subject to modification over the life of the plan due to changes in knowledge.

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Summary

The Bald-tip Beard Orchid *Calochilus richiae* is a small, terrestrial, deciduous orchid known only from a single location in northern Victoria. It is one of Australia's most threatened orchids, with fewer than 10 plants remaining in a single wild population. Major threats include grazing by macropods and human disturbance to the site. The species is listed as Endangered under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*. This national Recovery Plan for the Bald-tip Beard Orchid details the species' distribution and biology, conservation status, threats, and recovery objectives and actions necessary to ensure its long-term survival.

Species Information

Description

The Bald-tip Beard Orchid *Calochilus richiae* Nicholls (Nicholls 1929) is a small terrestrial, deciduous herb that emerges annually from a fleshy, irregular subterranean tuber. There is a single basal, stout, fleshy lanceolate leaf that is V-shaped in cross section, ribbed and dark green. The erect flower stem grows to 35 cm tall and has up to five yellowish-green to reddish-brown flowers with darker stripes, in an open raceme. The tepals are up to 15 mm long, while the distinctive labellum is ovate, covered with short purplish calli in the basal two-thirds, while the apex is glabrous with a narrow, inrolled tip (description from Walsh & Entwistle 1994; Backhouse & Jeanes 1995).

Little is known of the ecology of *C. richiae*. Plants are dormant from late spring to early autumn, when dormancy is normally broken in response to soaking rains. Flowering occurs in October, and flowers generally remain open for only a few days. Pollination is by male scollid wasps (genus *Campsomeris*), which may be attracted to the flowers by visual stimulus and/or scents (Backhouse & Jeanes 1995). Once it is attracted to a flower, the male usually attempts to copulate with the labellum, mistaking it for the female wasp, and effecting pollination. Fruits usually take 5–8 weeks to mature following pollination. Each mature capsule contains tens of thousands of minute seeds that are dispersed by wind when the capsule dries out and splits. Plants reproduce solely from seed.

Distribution

The Bald-tip Beard Orchid is endemic to Victoria, where it is known from a single wild population growing near Rushworth in north-central Victoria, in the Victorian Midlands bioregion (*sensu* DEH 2000) (Figure 1).



Figure 1. Distribution of Bald-tip Beard Orchid

Habitat

The Bald-tip Beard orchid grows in Heathy Dry Forest (Muir *et al.* 1995) dominated by *Eucalyptus* macrorhyncha (Red Stringybark), *E. polyanthemos* (Red Box) and *E. tricarpa* (Red Ironbark), with a low shrubby understorey including *Acacia pycnantha* (Golden Wattle), *A. paradoxa* (Hedge Wattle), *Leucopogon virgatus* (Common Beard-heath), *Daviesia ulicifolia* (Gorse Bitter-pea), *Dianella revoluta* (Black-anther Flax-lily), *Grevillea alpina* (Cat's Claws), *Brachyloma daphnoides* (Daphne Heath),

Cassinia arcuata (Drooping Cassinia) and *Xanthorrhoea australis* (Austral Grass-tree), and a sparse grassy ground layer of predominately *Joycea pallida* (Wallaby Grass), on shallow, stony clay loam soil over Devonian sediments (sandstone and interbedded siltstone) (Duncan & Traill 1999).

Population Information

The Bald-tip Beard Orchid is known from a single site, in Rushworth State Forest, near Rushorth in north-central Victoria. Fewer than 10 plants are known, with only a maximum of four flowering plants being observed since 2000.

Decline and Threats

There is little historical information on the past distribution and abundance of the Bald-tip Beard orchid. The species was originally discovered by Mrs. Rich in 1928 at a site near Rushworth, but was not seen again for many years until 1968, when the current population was discovered (Jones 1969). Within the current population, there has been an apparent decline in numbers of flowering plants, from about 23 seen in 1980, to eight in 1988, six in 1995, one in 1996 (G. Backhouse, pers. comm.) and between 0–4 flowering plants from 1998–2004 (P. Krake pers. comm.). The species faces a number of threats, including illegal collection, with a suggestion that up to a dozen plants were illegally collected in the early 1980s from the current population. During one season, all flowering stems were apparently cut off by a local enthusiast to discourage collection (Jones 1991). Human interference to and disturbance of the site is an ongoing problem. Although site location is kept confidential, the general location is known to some orchid enthusiasts, and vegetation and orchids have been trampled during their visits. Illegal firewood and post collection, rubbish dumping, mineral prospecting and recreational activities have all been reported from the immediate vacinity of the site.

Grazing by macropods is a serious problem at this site. In 1989, six of the 11 maturing seed capsules were eaten by herbivores (Schoknecht 1991), while in 2004, two of the four plants were grazed almost to ground level (P. Crake pers. comm.). The area has been subject to drought for at least seven of the last 10 years, and flowering is often aborted during periods of sustained hot, dry weather (pers. obs.). The reproductive capacity of the population, the potential to set seed, and thus the likelihood of seedling recruitment is similarly threatened by low numbers of individuals. There is a high risk of extinction due to small population size. Weed invasion is considered a minor problem at the site.

The box-ironbark forest habitat of *C. richiae* has had a long history of disturbance (Muir *et al.* 1995), especially from mining, which was prevalent in the area where the species currently grows. The forest was also harvested for timber, to the extent that little remains in original condition. It is quite possible that other populations of *C. richiae* once existed, but have been lost due to the extensive habitat disturbance that occurred in the region for well over 100 years.

Recovery Information

Existing conservation measures

A number of conservation measures for *C. richiae* have been undertaken, including:

- Commercial timber production (post harvesting and firewood collection) and prescribed burning have been excluded from the immediate area of the orchid population since 1980.
- A buffer zone has been established around the site to exclude mineral exploration.
- Much of the site was fenced in 2001, and in 2003 all plants were protected from grazing.
- A permanent monitoring transect and photo point was established at the site in 2003.
- Fine-scale site management commenced in 2003.
- Seed was collected in 2003 for long-term storage, while some was sown around the base of existing plants and some used in fungal baiting trials.
- In 2004, leaf tips and root pieces were harvested from living plants by staff from the Centre for Plant Biodviersity Research for DNA analysis and fungal isolation.
- Some site security is achieved by maintaining secrecy of the site location.
- Seed has been successfully germinated asymbiotically in laboratory trials, but seedling establishment in soil has so far been unsuccessful.

Recovery Objectives

The overall objective of recovery is to minimise the probability of extinction of the Bald-tip Beard Orchid in the wild and to increase the probability of populations becoming self-sustaining in the long term. Within the duration of this Recovery Plan, the specific objectives for the recovery of the Bald-tip Beard Orchid are to:

- Determine distribution, abundance and population structure
- Determine habitat requirements
- Manage threats to populations
- Identify key biological functions
- Determine growth rates and viability of populations
- Establish a population in cultivation
- Build community support for conservation

Program Implementation

The Recovery Plan will run for five years from the time of adoption. Implementation will be managed the Department of Sustainability and Environment. A Threatened Flora Recovery Team, consisting of scientists, land managers and field naturalists has been established to oversee threatened flora recovery in Victoria in general. Technical, scientific, habitat management or education components of the Recovery Plan will be referred to specialist sub-committees on research, *in situ* management, community education and cultivation.

Program Evaluation

The Recovery Team will be responsible for annual assessments of progress towards recovery. This Recovery Plan will be reviewed within five years of the date of its adoption under the EPBC Act.

Recovery Objectives, Actions and Performance Criteria

Action	Description	Performance Criteria					
Specific Objective 1: Determine distribution, abundance and population structure							
1.1	Undertake surveys to determine area & extent of populations; number, size & structure of populations; inference or estimation of population change.	 All known populations accurately counted and mapped. 					
	Responsibility: DSE						
Specific Objective 2: Determine habitat requirements							
2.1	Accurately survey known habitat and collect floristic and environmental information relevant to community ecology and condition.	Habitat critical to survival mapped for population.					
	Responsibility: DSE						
2.2	Identify and survey potential habitat, using ecological and bioclimatic information that may indicate habitat preference.	 Predictive model for potential habitat developed and tested at two sites. 					
	Responsibility: DSE						
Specific	Objective 3: Manage threats to populations						
3.1	Protect populations on public land.	Initiate a Special Protection Zone in State Forest.					
	Responsibility: DSE						
3.2	Control threats from macropods and other grazing	• Extending fenced area and caging all plants.					
		 No loss of plants to grazing. 					
		 Measurable seedling recruitment in affected population. 					

3.4 Control threats from disturbance. • No loss of or damage to population or habitat. Responsibility: DSE Specific Objective 4: Increase population size 4.1 Manage microhabitat for seeding recruitment. • Measurable increase in recruitment. Responsibility: DSE • Seed in short term storage. 4.2 Hand polinate plants and collect seed. • Seed in short term storage. 7.2 Responsibility: DSE/RBG • Measurable increase in recruitment. 4.3 Test seed viability and restock population with seed. • Measurable increase in recruitment. 7.8 Establish procedures for the non-destructive isolation of the througe throm living plants. • Mycorrhizal fungus isolated and in culture 7.1 Measure population trands and responses against recovery actions by collecting demographic information including recruitment and mortality, timing of the history stages and morphological data. • Population Viability Analysis completed. 7.1 Establish papeulations in cultivation of the wild population. • Seed in storage; longevity and viability determined. 6.2 Establish papeulation. • Effective propagation and tissue culture techniques developed. 7.2 Prepare site to achieve maximum survival of plants / germistand of seed, using fungal baiting techniques. • Criteria for site suitability identified and site site.	3.3	Control threats from pest plants.	•	Invasion of pest plants kept at or below current levels.				
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Specific objective 7: Establish new populations in the wild 7.1 Select and evaluate sites that are ecologically suitable, have secure land tenure and are managed appropriately. Criteria for site suitability identified and site selected. Responsibility: DSE, Recovery Team - At least one translocation site identified and prepared. 7.2 Prepare site to achieve maximum survival of plants / germination of seed, using fungal baiting techniques. - Translocation plan developed and approved. 7.3 Introduce and monitor plants from cultivation, or seed stock (sow seed and fungus mix directly into the field). Measurable increase in population size at the site. 8.1 Identify opportunities for community involvement in the conservation of the Bald-tip Beard Orchid. - Community nature conservation and Landcare groups aware of the species and support its conservation.		Responsibility: DSE, RBG, NOGN	•	At least 50 mature plants in cultivation.				
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Responsibility: DSE 7.3 Introduce and monitor plants from cultivation, or seed stock (sow seed and fungus mix directly into the field). • Measurable increase in population size at the site. Responsibility: DSE • Measurable increase in population size at the site. Specific Objective 8: Build community support for conservation 8.1 Identify opportunities for community involvement in the conservation of the Bald-tip Beard Orchid. • Community nature conservation and Landcare groups aware of the species and support its conservation.	7.2	Prepare site to achieve maximum survival of plants / germination of seed, using fungal baiting techniques.	•	Successful fungal baiting, direct seeding, and translocation techniques developed.				
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Responsibility: DSE conservation.	8.1	Identify opportunities for community involvement in the conservation of the Bald-tip Beard Orchid.	•	Community nature conservation and Landcare groups aware of the species and support its				
		Responsibility: DSE		conservation.				

Abbreviations: DSE – Department of Sustainability and Environment (Victoria); RBG – Royal Botanic Gardens, Melbourne; NOGN – Native Orchid Growers Network

Management practices

On-ground site management will aim to mitigate threatening processes and thereby insure against extinction. Major threats requiring management include accidental destruction and grazing. A range of strategies will be necessary to mitigate these threats including caging/fencing and control of predators. Broadscale protection measures applicable to the population include legal protection of the site, In addition, searches of known and potential habitat should continue to better define the distributions and size of populations.

The recovery plan also advocates strategies to fill some of the major gaps in our knowledge to date. These include an understanding of seed bank dynamics, pollination and recruitment. Successful *in situ* population management will be founded on understanding the obligate relationships between *C. richiae* and associated flora, as well as its response to environmental processes. These are directly linked to seed production, recruitment and regeneration and are thus vital to recovery. Demographic censusing will be necessary to gather life history information and to monitor the success of particular management actions. In addition, *ex situ* conservation measures will be required and will include seed storage and plant cultivation. Cultivating *ex situ* populations will also aim to increase the amount of seed available for reintroduction to sites. Translocation of cultivated plants will be considered only where there is a high chance of success, and where secure sites exist.

Community involvement in the conservation of *C. richiae* will be encouraged. This will involve fostering the involvement of local community groups in the conservation of this species. Damage to orchid populations by visitors and illegal collection has occurred in the past, and for this reason community involvement will be restricted to groups having demonstrated ability and commitment to *in situ* orchid conservation.

Affected interests

The only known population of *C. richiae* occurs within the Rushworth State Forest and consequently management is the responsibility of the Victorian Department of Sustainability and Environment. This recovery plan has the support of government agencies, statutory authorities and community groups involved in orchid conservation in Victoria (DSE, National Herbarium of Victoria, and various field naturalists clubs), who will assist in the management and monitoring of this species.

Role and interests of indigenous people

Indigenous communities on whose traditional lands the Bald-tip Beard Orchid occurs are being advised, through the relevant DSE Regional Indigenous Facilitator, of this Recovery Plan and invited to provide comments. Indigenous communities will be invited to be involved in the implementation of the Recovery Plan.

Social and economic impacts

The implementation of this recovery plan is unlikely to cause significant adverse social and economic impacts, as the species occurs only at a single site, on public land managed as State Forest.

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References

Backhouse, G. N. and Jeanes, J. A. (1995) The Orchids of Victoria. The Meigunyah Press, Melbourne.
 Duncan, S. and Traill, B. J. (1999) Survey Design for Calochilus richiae in the Rushworth Forest. Australian Woodlands Conservancy.

DEH 2000. Revision of the Interim Biogeographic Regionalisation of Australia (IBRA) and the Development of Version 5.1. - Summary Report. Department of the Environment and Heritage, Canberra.

Jones, D. L. (1969) Rediscovery of Calochilus richiae. Victorian Naturalist 86: 318-319.

- Jones, D. L. (1991). Some rare or threatened Australian orchids. In, Conservation of Rare of Threatened Plants in Australia. The Proceedings of the Conference: Productive Custody – Ex Situ Plant Conservation in Australasia. (eds G.Butler, L.Meredith & M.Richardson) Pp. 203-206. Australian National Botanic Gardens and Australian National Parks and Wildlife Service.
- Muir, A. M., Edwards, S. A., and Dickins, J. M. (1995) Description and Conservation Status of the Vegetation of the Box-Ironbark Ecosystem in Victoria. Flora and Fauna Technical Report No. 136. Department of Natural Resources and Environment, Victoria.
- Nicholls, W. H. (1929) A new Victorian orchid. Victorian Naturalist 45: 233.
- Schoknecht, N. (1991) Bald-tip Beard-orchid (Calochilus richiae). Action Statement No. 5. Department of Conservation and Environment, Bendigo, Victoria.
- Walsh, N. G. and Entwisle, T. J. (1994). Flora of Victoria Vol 2. Inkata, Melbourne.

Priority, feasibility and estimated costs of recovery actions

Action	Description	Priority	Feasibility	Responsibility	Cost estimate					
					Year 1	Year 2	Year 3	Year 4	Year 5	Total
1	Distribution, abundance									
1.1	Surveys	1	100%	DSE	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$25,000
2	Habitat requirements									
2.1	Known habitat	1	100%	DSE	\$10,000	\$10,000	\$0	\$0	\$0	\$20,000
2.2	Potential habitat	1	75%	DSE	\$0	\$5,000	\$10,000	\$0	\$0	\$15,000
3	Manage threats									
3.1	Public land	1	100%	DSE	\$5,000	\$0	\$0	\$0	\$0	\$5,000
3.2	Grazing	1	75%	DSE	\$20,000	\$5,000	\$2,000	\$2,000	\$2,000	\$31,000
3.3	Pest plants	1	75%	DSE	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$10,000
3.3	Disturbance	1	75%	DSE	\$5,000	\$5,000	\$2,000	\$2,000	\$2,000	\$16,000
4	Increase population size									
4.1	Microhabitat mgt	1	75%	DSE	\$5,000	\$5,000	\$2,000	\$2,000	\$2,000	\$16,000
4.2	Pollination, seed collection	1	75%	DSE	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$10,000
4.3	Restock	1	75%	DSE	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$10,000
4.4	Myccorhizal fungus	1	75%	DSE	\$2,000	\$2,000	\$2,000	\$0	\$0	\$6,000
5	Growth rates, viability									
5.1	Population trends	2	75%	DSE	\$5,000	\$5,000	\$5,000	\$5,000	\$5,000	\$15,000
6	Cultivation									
6.1	Seedbank	2	100%	RBG/DSE	\$5,000	\$2,000	\$1,000	\$1,000	\$1,000	\$10,000
6.2	Cultivated plants	2	50%	RBG/DSE/ANOS	\$2,000	\$2,000	\$2,000	\$2,000	\$2,000	\$10,000
7	Establish new population									
7.1	Site selection	2	75%	DSE	\$2,000	\$2,000	\$0	\$0	\$0	\$4,000
7.2	Site preparation	2	75%	DSE	\$0	\$0	\$2,000	\$5,000	\$2,000	\$10,000
7.3	Introduction, monitoring	2	75%	DSE	\$0	\$0	\$0	\$0	\$5,000	\$5,000
8	Communication									
8.1	Community extension	3	100%	DSE	\$1,000	\$1,000	\$1,000	\$1,000	\$1,000	\$5,000
				TOTALS	\$73,000	\$55,000	\$40,000	\$31,000	\$33,000	\$223,000