

Draft Revision (2009)

Flora and Fauna Guarantee Action Statement No. 23

Limestone Spider-orchid *Caladenia calcicola*

Description

The Limestone Spider-orchid (*Caladenia calcicola*, G. W. Carr), bears one or two glossy pale yellow flowers about 35 mm across with deep red central stripes and a deep red labellum. The sepals end in prominent reddish or occasionally yellow clubs about 6 mm long. The hairy erect stem, up to 28 cm high, arises from a single leaf up to 15 cm long and 1.5 cm wide, densely hairy on both surfaces and red-spotted at the base. The plant produces leaves from a tuber and flowers from mid September to early November. A full description can be found in Carr (1986) and Jones (2006). *Caladenia calcicola* is a member of the *Caladenia reticulata* complex, a group of spider-orchids which are morphologically similar and have been recently shown to share the same pollinator, *Phymatothygnus* nr. *nitidus* (Bower 2008). The taxonomic status of *Caladenia calcicola* may be revised in the future to reflect these findings (Bower pers. comm. 2009). *Caladenia calcicola* is currently distinguished from other similar species and members of the *reticulata* complex by its shiny labellum, the calli arrangement (which is distinctly crowded) and the habitat in which it is found.

Distribution

The Limestone Spider-orchid is known historically from south-western Victoria and south-eastern South Australia, including Mt Burr (in south-eastern South Australia), Nelson, Bat's Ridge near Portland and on private property near Dunkeld (Murphy *et al.* in prep.). There are currently six sub-populations and two reintroduced populations.

There are currently no known extant populations in South Australia.

Habitat

According to Carr (1986), the Limestone Spider-orchid appears to be restricted to fairly open habitat on limestone ridges with shallow, sandy, well-drained soils, and is the only species of spider orchid (*Caladenia* section *Calonema*) found in this habitat. Its preferred aspect and topographical position (i.e. ridge, upper or mid-slope) have not been documented. The species occurs in Limestone Ridge Woodland, Limestone Woodland and in Grassy Woodland/Hills Herb-rich Woodland/Damp Sands Herb-rich Woodland mosaic. Dominant species vary from site to site but include Manna Gum (*Eucalyptus viminalis* ssp. *cygnetensis*), Golden Wattle (*Acacia pycnantha*), Coast Wattle (*Acacia longifolia* var. *sophorae*), Coast Beard-heath (*Leucopogon parviflorus*), Drooping Sheoak (*Allocasuarina verticillata*), Swamp Gum (*Eucalyptus ovata*), Myrtle Wattle (*Acacia myrtifolia*), Common Heath (*Epacris impressa*), Silver Banksia (*Banksia marginata*) and Bracken Fern (*Pteridium esculentum*) (Murphy *et al.* in prep.). Critical habitat for the Limestone Spider-orchid also includes those plants required by the pollinator, a thynnine wasp (thynnines have been observed to feed on shallow nectar-rich flowers such as *Leptospermum* and *Eucalyptus* G. Brown pers. comm. 2009) and its larval hosts.

Life history and ecology

Caladenia species are dormant during summer. Following flowering the leaf and floral remains wither and the plant dies back down to an underground tuber which is replaced annually. A new leaf then emerges after the first autumn rains the following season. Pollination is carried out by a male thynnine wasp identified by Bower (2006) as *Phymatothygnus* nr. *nitidus* (*Tiphiiidae: Thynninae*), which attempts pseudocopulation with the flower. Observations by Carr (1986) suggest that between 5% and 10% of plants are pollinated annually. In 2007, 7.5% of a monitored population were naturally pollinated (DSE 2007). The ecological and biological requirements of the pollinator are poorly understood but they are known to feed on nectar-rich, shallow flowers such as *Leptospermum* and *Eucalyptus*. The burrowing flightless females parasitise *Coleoptera* (scarab beetle) larvae, onto which they lay their eggs. The biological requirements and exact identity of the larval host are not known, but it is likely that adults feed on nectar and/or eucalypt foliage.

The importance of fire in promoting flowering and providing a suitable medium for seedling establishment is also unclear and the removal of canopy cover through fire may not contribute to seedling establishment, as the habitat of the species is naturally open, due to the poor skeletal soils and outcropping limestone. Flowering in many species of *Caladenia* is stimulated by summer fire (Jones 1988). However, fire is not essential for flowering of the Limestone Spider-orchid to occur.

Like other terrestrial orchids, the Limestone Spider-orchid also depends on a relationship with a mycorrhizal fungus for seed germination and for assisting in nutrient uptake, growth and survival.

Conservation status

National conservation status

The Limestone Spider-orchid has been listed as “vulnerable” under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999*.

Victorian conservation status

The Limestone Spider-orchid has been listed as “threatened” under the *Flora and Fauna Guarantee Act 1988*.

The Limestone Spider-orchid is considered “Endangered” in Victoria according to DSE’s *Advisory List of Rare or Threatened Plants in Victoria - 2005* (DSE 2005).

Threats

Terrestrial orchids are small often cryptic plants which, when coupled with their dormancy period, are often only noticeable for a relatively short time during flowering and therefore easily overlooked. Approximately half of all Victoria's native orchid species are seriously in decline or threatened with extinction (Jeanes & Backhouse 2006). Spider-orchids do not spread vegetatively or form colonies so recruitment relies on successful pollination and seed production, which is crucial to maintaining and increasing populations in the long term. When combined with the often highly specific relationship between orchid and pollinator, Spider-orchids are particularly at risk and are particularly vulnerable to any habitat disturbance, degradation or fragmentation. These are considered major threats that may interrupt or inhibit the natural cycles involved. The small number of plants remaining (the total number of known plants is estimated at 277 individuals) means that any loss to the overall population is significant. Threats such as frequent grazing of flowers and pods by macropods and other animals have a large impact on the individual plant's ability to reproduce and on the species as a whole. Furthermore not all individuals flower in any given year and of those, only 5-10% are naturally pollinated (Carr 1986). This issue also applies to accidental damage caused by human activities such as trampling. With so few plants, any loss of plants is considered significant. Inappropriately timed fire may also have potential to impact heavily on the species, particularly as the largest, most significant population (nearly 98% of all known plants) occurs within a single small reserve. While fire could promote flowering, an ill-timed event could interrupt the growth period, prevent seed production or prevent flowering of pollinator food plants such as *Leptospermum*. Habitat is highly restricted and all remaining potential habitat needs to be considered as critical to the ongoing survival of the species (Murphy *et al.* in prep.). Leigh *et al.* (1984) recommend that 'the size of the reserve necessary to protect the orchid species must be large enough to protect the other plants on which the pollinator wasp feeds.

<i>Standard threat</i>	<i>Source Of Threat</i>	<i>Explanation</i>
Habitat fragmentation.	Construction/maintenance - fuel breaks.	Suitable habitat for <i>Caladenia calcicola</i> is already very restricted so any destruction or alteration would further limit potential reintroduction sites and available areas for the species to colonise.
Herbivory.	Animals - native species.	Flowers are frequently grazed off which prevents seed production and dispersal. At one monitored site, 60% of plants were grazed. While grazing by native species is a natural occurrence, when overall numbers of a species are low, the effect is significant.
Herbivory.	Animals - other species.	<i>Caladenia calcicola</i> cannot support additional grazing pressures from exotic animals such as rabbits on top of grazing by native herbivores.
Human disturbance.	Recreational activities - motorised (4wds, trail bikes, boats etc).	<i>Caladenia calcicola</i> is small, easily overlooked, very difficult to locate from a moving vehicle and therefore vulnerable to accidental damage. Plants are easily crushed, which could prevent flowering or seed production. Soil disturbance could lead to the death of the plants, by either exposing tubers or disturbing the mycorrhiza.

Inappropriate fire regimes.	Fire - season or time.	The timing of a fire event can affect or interrupt the life cycle of <i>Caladenia calcicola</i> and potentially, both the mycorrhiza and the pollinator on which it depends. Late summer or early autumn burning while the orchid is dormant are ideal. Early summer fire may prevent seed dispersal and flowering of pollinator food plants and late autumn fire will destroy newly emerged leaves. Spring burning would prevent flowering and seed production and place significant stress on the tuber's reserves.
Loss of important habitat features.	Lack of pollination.	<i>Caladenia calcicola</i> does not reproduce vegetatively; population increase depends on seed dispersal. Effective recruitment is therefore dependent on sufficient numbers of flowers being pollinated and overlap in the distribution of the pollinators and the orchids.
Weather.	Weather - climate change.	Flowering levels (and therefore seed production) decrease in drought conditions when the plant becomes stressed. Flowers wilt and capsules abort if conditions are too dry. The flowering of <i>Caladenia calcicola</i> is synchronised with pollinator emergence and activity. If the meteorological cues for flowering and pollinator emergence differ changes in climate may affect the overall number of days in which pollination could occur. Severe drought also has the potential to reduce pollinator populations.

Important populations

<i>Location name</i>	<i>Land manager</i>	<i>Catchment</i>	<i>Bioregion</i>
Bats Ridge Wildlife Reserve (WR)	Parks Victoria	Glenelg-Hopkins	Glenelg Plain
Lower Glenelg National Park (NP)	Parks Victoria	Glenelg-Hopkins	Glenelg Plain
Bats Ridge Private Land	Landholder	Glenelg-Hopkins	Glenelg Plain
Brie Brie Private Land	Trust For Nature	Glenelg-Hopkins	Dundas Tablelands
Bats Ridge reintroduction(a)	Parks Victoria	Glenelg-Hopkins	Glenelg Plain
Bats Ridge reintroduction(b)	Parks Victoria	Glenelg-Hopkins	Glenelg Plain

Past management actions

<i>Action</i>	<i>Result explanation</i>
Involve community groups and volunteers in recovery activities.	Community extension activities commenced in 2005, involving local field naturalists, Australian Native Orchid Society (ANOS) and individual community members. In the 2008 flowering season over twenty volunteer hours were spent searching for new plants and several were discovered.
Undertake detailed population monitoring and collect demographic information.	Monitoring of individual plants commenced in 2003 and is conducted at least twice yearly.
Conduct priority research projects as specified.	Natural pollination levels are evaluated annually. Investigation into pollinator biological requirements commenced in 2006, undertaken by Florasearch and the initial findings published (see Bower, 2006). The life cycle of thynnine wasps was described in publications by Burrell (1935), Alcock (1981) and Ridsill Smith (1970), however the information pertained to thynnines in general and was not specific to the species in question.
Establish/maintain Recovery Team.	The Recovery Team was made up of individuals representing community non-government organisations and government agencies. The Recovery Team was also linked to the statewide Threatened Orchid Recovery Team (TORT).

Identify grazing management priorities and develop detailed plan.	Target species were identified as Eastern Grey Kangaroo, Red-necked Wallaby, Emu and Rabbit.
Undertake research into management requirements.	Seed viability was tested in 2006 when the ex-situ propagation program commenced.
Review conservation status.	<i>Caladenia calcicola</i> is awaiting a formal EPBC listing review. It is likely that the result of this review will change its current status from Vulnerable to Threatened.
Facilitate/promote research.	Two research papers were produced in 2008 with input from DSE Threatened Species staff, one described reintroduction techniques and results (Wright <i>et al.</i> 2009) and the other examined mycorrhizal specificity in the <i>Caladenia reticulata</i> complex (Ramli <i>et al.</i> 2008).
Conduct workshops, seminars or symposia on research / management issues.	Annual three-day workshops to discuss management issues and techniques have been held since 2005. A variety of expert speakers and approximately forty five participants attend each day on average. Workshops were held in Castlemaine (2005), Plenty Gorge (2006), Lake Fyans (2007) and Wilson's Promontory (2008).
Conduct survey to determine abundance/extent of population.	Suitable habitat was searched annually during flowering time since 2005. In 2008 additional plants were found at Bat's Ridge as a result of these activities. Areas surveyed were Lower Glenelg NP, Bats Ridge and South Australia.
Erect/maintain cages, fences or other structures to exclude native animals.	Fences were erected in 2007 in some areas to exclude grazing and individual plants were caged. Cages were maintained at least twice yearly. Caging of flowering plants commenced in 2005.
Conduct artificial pollination.	Individual flowering plants have been hand pollinated to increase seed production on an annual basis since 2005.
Establish and maintain a reintroduced / translocated population.	In 2007, 66 ex-situ grown seedlings were successfully reintroduced to two sites. Following flowering and several natural pollination events in 2007, 75% re-emerged in 2008.
Prepare a plan for reintroduction / translocation.	A Reintroduction Plan was prepared in July 2007 by DSE.
Maintain <i>ex situ</i> plant collections.	A small ex-situ collection of <i>Caladenia calcicola</i> has been maintained at the Royal Botanic Gardens, Melbourne (McQualter pers. comm.).
Collect reproductive material.	Seed was collected from two separate locations in 2007. Seed is collected annually.
Develop, publish and distribute educational, technical or publicity material and/or displays.	A Threatened Species Fact Sheet highlighting the plight of the species and providing information was developed in 2008.
Store reproductive material.	A total of twelve batches of seed were put into storage in 2007 at the Royal Botanic Gardens Melbourne.

Conservation objectives

Long term objective

To ensure that Limestone Spider-orchid can survive, flourish and maintain its potential for evolutionary development in the wild.

Objectives of this Action Statement

- To increase the number of populations or individuals.
- To improve habitat condition.
- To secure populations or habitat from potentially incompatible land use or catastrophic loss.

- To increase knowledge of biology, ecology or management requirements.
- To increase community awareness and support.

Intended management actions

The intended management actions listed below are further elaborated in DSE's Actions for Biodiversity Conservation (ABC) system. Detailed information about the actions and locations, including priorities, is held in this system and will be provided annually to land managers and other authorities.

<i>Standard objective</i>	<i>Targets</i>	
To increase the number of populations or individuals.	<ul style="list-style-type: none"> • Number of populations or individuals of the Limestone Spider-orchid increased using a variety of <i>in situ</i> and <i>ex situ</i> management techniques, thereby decreasing the risk of extinction. 	
<i>Action</i>	<i>Details</i>	<i>Responsible agents</i>
Collect reproductive material.	A percentage of seed to be collected on an annual basis for long-term storage and the ex-situ propagation program, which supplies plants for reintroduction.	DSE Statewide Services – South West, Royal Botanic Gardens
Conduct artificial pollination.	Hand pollinate selected plants on an annual basis, rotating to prevent reduction in long-term plant vigour.	DSE Statewide Services – South West
Identify sites for reintroduction / translocation.	Identify a site in Lower Glenelg NP for reintroduction of ex-situ grown plants.	DSE Statewide Services – South West, Parks Victoria
Establish and maintain a reintroduced / translocated population.	If production of ex-situ seedlings and fungal isolations are successful, undertake a further reintroduction of ex-situ grown plants into Lower Glenelg National Park.	DSE Statewide Services – South West
Prepare a plan for reintroduction / translocation.	Once there are plants ready and a suitable site has been selected, prepare a Reintroduction Plan outlining the method of reintroduction.	DSE Statewide Services – South West
Store reproductive material.	Continue to collect and store seed as needed for reintroductions.	DSE Statewide Services – South West

<i>Standard objective</i>	<i>Targets</i>	
To improve condition of habitat.	<ul style="list-style-type: none"> • Condition of the habitat improved to maximise the potential for plant growth and recruitment. 	
<i>Action</i>	<i>Details</i>	<i>Responsible agents</i>
Erect/maintain cages, fences or other structures to exclude native animals.	On an annual basis, cage individual flowering plants to exclude grazing by target species Eastern Grey Kangaroos, Red-necked Wallabies and Emus.	DSE Statewide Services- South West, Parks Victoria
Manage environmental weeds.	Identify weed species and implement management plan.	DSE Statewide Services – South West

<i>Standard objective</i>	<i>Targets</i>	
To secure populations or habitat from potentially incompatible land use or catastrophic loss.	<ul style="list-style-type: none"> • No avoidable loss of remaining habitat and populations. 	
<i>Action</i>	<i>Details</i>	<i>Responsible agents</i>
Establish/maintain Recovery Team.	Maintain the Threatened Orchid Recovery Team with members from community non-government organisations and government agencies.	DSE Biodiversity & Ecosystem Services, DSE Statewide Services– South West

Negotiate application of conservation covenant.	Protect key private land populations.	DSE Statewide Services – South West
Negotiate voluntary acquisition or exchange of land.	Increase into the reserve system the amount of important habitat EVC (Limestone Ridge Woodlands EVC 664) for this species.	DSE
Prepare/revise Recovery Plan.	Re-prioritise and adjust recovery actions and/or threat management. Revise and finalise the Recovery Plan for the 2009-2013 period, in partnership with the SA Department of Environment and Heritage (DEH).	DSE

<i>Standard objective</i>	<i>Targets</i>	
To increase knowledge of biology, ecology or management requirements.	<ul style="list-style-type: none"> Knowledge increased of the biology, ecology and distribution of the Limestone Spider-orchid, the threats to the species and processes that assist in management and recovery of the species. 	
<i>Action</i>	<i>Details</i>	<i>Responsible agents</i>
Assess threats.	Assess the threats at all known and historical Limestone Spider-orchid sites.	DSE Statewide Services – South West
Conduct priority research projects as specified.	Identify ecological correlates of populations and prepare habitat descriptions.	DSE Statewide Services – South West
Conduct survey to determine abundance/extent of population.	Search suitable habitat, includes known and potential sites.	DSE Statewide Services – South West, DEH SA, SE Region
Conduct workshops, seminars or symposia on research/management issues.	Conduct workshops and symposia on in-situ recovery techniques.	DSE Biodiversity & Ecosystem Services
Facilitate/promote research.	Encourage and support research by higher education institutions and existing research partners.	DSE Biodiversity & Ecosystem Services
Identify disturbance regimes to maintain habitat or promote regeneration and recruitment.	Identify disturbance regimes to promote regeneration and recruitment. Regimes to include other management options including slashing and ground disturbance.	DSE Statewide Services – South West
Review conservation status.	The species requires a formal EPBC listing review (Pritchard pers. comm.).	DSE Biodiversity & Ecosystem Services
Undertake detailed population monitoring and collect demographic information.	Conduct annual censusing of populations.	DSE Statewide Services – South West
Undertake research into management requirements.	Determine the effects of artificial pollination on growth, survival and reproduction.	DSE Statewide Services – South West

<i>Standard objective</i>	<i>Targets</i>	
To increase community awareness and support.	<ul style="list-style-type: none"> Information provided to organisations, local interest groups, community members and other stakeholders regarding the biological requirements of the Limestone Spider-orchid. Opportunities for community participation provided. 	

<i>Action</i>	<i>Details</i>	<i>Responsible agents</i>
Develop, publish and distribute educational, technical or publicity material and/or displays.	Prepare technical educational material such as Threatened Species Fact Sheet on <i>in situ</i> recovery techniques.	DSE Statewide Services – South West

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