

## *Caladenia lowanensis* Wimmera Spider-orchid

### Taxonomy

*Caladenia lowanensis* G.W. Carr

### Current conservation status

Listed as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999*.

Listed as threatened under the *Flora and Fauna Guarantee Act 1988* (SAC 1995).

Categorised as Endangered in the 2014 Advisory list of rare or threatened flora (DEPI 2014).

### Proposed conservation status

Critically Endangered in Victoria

Criteria A2ace+3ce+4ace; C1

### Species Information

#### Description and Life History

The taxon is herbaceous perennial geophyte which is 25 cm high with a single leaf 12 cm long and a single flower. It is a deciduous orchid that dies back annually to a small, spherical, underground tuber. The single green leaf grows from the base of the stem. The slender, hairy flower stem has a single pale yellow and variably red striped flower to 40 mm across. The sepals and petals are up to 40 mm long and are stiffly spread and down curved. The central petal (labellum) is narrowly triangular with a red-striped yellowish base and reddish tip. The expanded part of the labellum has four rows of very short, thick, glossy, reddish to blackish glands. The labellum margins are fringed with short thickened teeth, decreasing in size and extending to the tip. The taxon is a winter active geophyte with emergence occurring in concert with cooler conditions and the onset of winter rainfall (TSSC 2016).

Flowering occurs from September to October, followed by a summer dormancy, and remain open if not pollinated for 4-6 weeks. Flowers close a day or so after pollination and seed ripens and is shed 3-4 weeks later.

Reproduction is exclusively by seed, which are minute and very numerous, and are dispersed by the wind when the capsule dries out. The seed is assumed to be short lived in nature (not beyond a year) so that there is no carryover from one season to the next. This taxon is known to hybridise with *C. tensa* and *C. cardiochila* (SAC 1995).

Spider-orchids use either food deception or sexual deception for pollination, the usual pollinator is male wasps from the family Thynnidae (DSE 2000). A scent that mimics female thynnid wasp pheromone is produced by the glandular tips of the sepals and acts as a sexual attractant for the pollinators. Once the pollinator reaches the flower, it attempts to copulate with the labellum of the flower, mistaking it for the female wasp, and effects pollination (DSE 2000).

Most spider-orchids grow in a complex relationship with mycorrhizal fungi which is critical for growth and development (DSE 2000). The fungus assimilates some nutrients for the orchid, but the degree of nutritional dependence upon the fungus by spider-orchids is not clearly understood. Longevity is unknown but there are examples of individuals of one taxa of spider-orchid having survived for at least 17 years in the wild (DSE 2000).

Most terrestrial orchids have evolved under conditions of hot summer fires, generally when the plants have been dormant. Some *Caladenia* taxa flower vigorously following hot summer fires, but this may be as much the result of



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the removal of surrounding vegetation and reduced competition as any chemical effect of the fire (DSE 2000). The timing of fire is important, with the best time during late summer or early autumn, after seed dispersal but prior to new plant emergence. Rainfall and temperature also influence flowering, which is often aborted when periods of sustained hot, dry weather follow flower opening (DSE 2000).

Despite being named in 1991, this taxon has never had a detailed formal botanical description prepared, and there is considerable confusion over its identification, distribution, and abundance (Backhouse et al. 2016). At the type location at Kiata, in years of good winter rains there can be hundreds of flowering plants, and it is clear that a fair amount of variation is present. Perhaps only 20% of clubbed spider-orchids there display the typical *lowanensis* characters, with the majority of plants more like *C. reticulata*. *C. lowanensis* is considered to be a rare orchid that occurs in small highly disjunct populations, with much of its habitat having long been cleared for agriculture. Plants have been propagated in cultivation prior to reintroductions to boost numbers of this taxon in the wild (Backhouse et al. 2016).

## Generation Length

The generation length of *Caladenia lowanensis* is estimated to be 20 to 40 years (midpoint 30 years). Generation time for non-colonial terrestrial orchids is estimated to be a nominal 30 years based on the annual replacement of the mother tuber by daughter tubers. Whilst somatically immortal, individuals are susceptible to endogenous exhaustion or environmental causes of mortality at rates likely to result in replacement at intervals of several decades only. Such orchids are classed as obligate seed regenerators reliant on seed-based recruitment for population maintenance.

## Distribution

The taxon is patchily distributed in the Little Desert region west from Wail, at an altitude range 75-210 metres above sea level (Backhouse et al. 2016). Until recently, the taxon was thought to be endemic to Victoria where it was found at a few sites in and near the Little Desert National Park (VicFlora 2018). The taxon's former distribution is unknown, but the habitat occupied by the taxon at the Kiata Flora Reserve was once widespread and abundant, heading into South Australia (SAC 1995), and may have included the broader Wimmera region of western Victoria.

## Habitat

The taxon grows in *Callitris* sp. (Cypress Pine), *Eucalyptus leucoxylon* (Yellow Gum), and *Melaleuca uncinata* (Broombrush Mallee) woodlands, on well-drained sandy loam soils derived from Tertiary and Quaternary wind deposits (Backhouse et al. 2016; TSSC 2016; VicFlora 2018). Associated taxa include Gre Mulga, Wallowa, and Spear-grasses (SAC 1995).

## Threats

There has almost certainly been a historic decline in distribution and abundance from widespread clearing and degradation of habitat across its range, mainly from agriculture, most likely resulting in the loss of subpopulations.

All subpopulations and habitat are considered at risk from disturbance by off-road vehicles, track maintenance, rubbish dumping, grazing by rabbits and hares, trampling, collection of specimens, weed invasion, and increasingly dry conditions from declining rainfall. The very small subpopulations are highly susceptible to stochastic events, which could cause major decline or local extinction within a very short time frame (TSSC 2016).

Additional threats include timing and frequency of fires by altering the habitat, removing organic surface materials, and negatively impacting pollinators and mycorrhizal agents, specifically fires that occur in autumn, winter, and spring after the taxon shoots but before seed is set (TSSC 2016).

Invasive taxa also pose a threat to all subpopulations. Problem weeds included *Ehrharta longifolia* (Veldt Grass), *Briza maxima* (Large Quaking Grass), *Asparagus asparagoides* (Bridal Creeper), and *Chrysanthemoides monilifera* subsp. *monilifera* (Boneseed).

### IUCN Criteria

Criterion A. Population size reduction. Population reduction (measured over the longer of 10 years or 3 generations) based on any of A1 to A4			
	Critically Endangered	Endangered	Vulnerable
A1	≥ 90%	≥ 70%	≥ 50%
A2, A3, A4	≥ 80%	≥ 50%	≥ 30%
<p>A1 Population reduction observed, estimated, inferred or suspected in the past and the causes of the reduction are clearly reversible AND understood AND ceased.</p> <p>A2 Population reduction observed, estimated, inferred or suspected in the past where the causes of the reduction may not have ceased OR may not be understood OR may not be reversible.</p> <p>A3 Population reduction, projected or suspected to be met in the future (up to a maximum of 100 years) [(a) cannot be used for A3]</p> <p>A4 An observed, estimated, inferred, projected or suspected population reduction where the time period must include both the past and the future (up to a max. of 100 years in future), and where the causes of reduction may not have ceased OR may not be understood OR may not be reversible.</p>			
<p>based on any of the following:</p> <ul style="list-style-type: none"> <li>(a) direct observation [except A3]</li> <li>(b) an index of abundance appropriate to the taxon</li> <li>(c) a decline in area of occupancy, extent of occurrence and/or quality of habitat</li> <li>(d) actual or potential levels of exploitation</li> <li>(e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites</li> </ul>			

### Evidence:

#### Eligible under Criterion A2 as Critically Endangered

The population reduction over the past 60 to 120 years is inferred to be 30 to 95% (likely 80%), based on (a), (c) and (e) above.

The taxon has declined in the largest single subpopulation, at Kiata, from perhaps 1,000 plants to fewer than 200 plants over the last 30 years. There has almost certainly been a historic decline in distribution and abundance from widespread clearing and degradation of habitat across its range, mainly from agriculture, most likely resulting in the loss of subpopulations.

The causes of the reduction may not have ceased, be understood or be reversible.

#### Eligible under Criterion A3 as Critically Endangered

The population reduction over the next 60 to 100 years is projected to be 50 to 80%, based on (c) and (e) above.

Future decline is inferred from the declining habitat conditions and recent declines in, and loss of, subpopulations. All subpopulations and habitat are considered at risk from ongoing disturbance, predation, weed invasion, and increasingly dry conditions from declining rainfall.

#### Eligible under Criterion A4 as Critically Endangered

The population reduction over any 60 to 120 year period, including both past and future (up to 100 years in the future), is inferred to be 50 to 95%, based on (a), (c) and (e) above. The causes of reduction may not have ceased, be understood or be reversible.

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Criterion B. Geographic range in the form of either B1 (extent of occurrence) and/or B2 (area of occupancy)			
	Critically Endangered Very restricted	Endangered Restricted	Vulnerable Limited
B1. Extent of occurrence (EOO)	< 100 km <sup>2</sup>	< 5,000 km <sup>2</sup>	< 20,000 km <sup>2</sup>
B2. Area of occupancy (AOO)	< 10 km <sup>2</sup>	< 500 km <sup>2</sup>	< 2,000 km <sup>2</sup>
AND at least 2 of the following 3 conditions:			
(a) Severely fragmented OR Number of locations	= 1	≤ 5	≤ 10
(b) Continuing decline observed, estimated, inferred or projected in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) area, extent and/or quality of habitat; (iv) number of locations or subpopulations; (v) number of mature individuals			
(c) Extreme fluctuations in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals			

### Evidence:

#### Eligible under Criterion B as Endangered

The Extent of Occurrence (EoO) is estimated to be 421 km<sup>2</sup>, based on accepted, post-1970 records in the Victorian Biodiversity Atlas (VBA).

The Area of Occupancy (AoO) is estimated to be 77 km<sup>2</sup>, based on 2 x 2 km grids derived from accepted, post-1970 records in the VBA.

The taxon is estimated to be severely fragmented, has 1 location, and has a continuing decline in (i) and (ii) above.

Criterion C. Small Population size and decline				
		Critically Endangered	Endangered	Vulnerable
Number of mature individuals		< 250	< 2,500	< 10,000
AND at least one of <u>C1</u> or <u>C2</u>				
<u>C1</u>	An observed, estimated or projected continuing decline of at least (up to a max. of 100 years in future):	25% in 3 years or 1 generation (whichever is longer)	20% in 5 years or 2 generations (whichever is longer)	10% in 10 years or 3 generations (whichever is longer)
<u>C2</u>	An observed, estimated, projected or inferred continuing decline AND least 1 of the following 3 conditions:			
(a)	(i) Number of mature individuals in each subpopulation	≤ 50	≤ 250	≤ 1,000
	(ii) % of mature individuals in one subpopulation =	90 – 100%	95 – 100%	100%
(b) Extreme fluctuations in the number of mature individuals				

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### Evidence:

#### Eligible under Criterion C1 as Critically Endangered

It is estimated that there are 150 to 300 mature individuals. There is estimated to be a continuing decline of 15 to 30% within one generation, based on the declining habitat conditions and recent declines and loss of subpopulations.

Criterion D - Very small or restricted population <sup>Ⓜ</sup>			
	Critically Endangered <sup>Ⓜ</sup>	Endangered <sup>Ⓜ</sup>	Vulnerable <sup>Ⓜ</sup>
Number of mature individuals (observed or estimated) <sup>Ⓜ</sup>	<50 <sup>Ⓜ</sup>	<250 <sup>Ⓜ</sup>	<1,000 <sup>Ⓜ</sup>
D2 - Only applies to the VU category <sup>Ⓜ</sup> Restricted area of occupancy or number of locations with a plausible future threat that could drive the species to critically endangered or Extinct in a very short time. <sup>Ⓜ</sup>	- <sup>Ⓜ</sup>	- <sup>Ⓜ</sup>	D2 - Typically: <sup>Ⓜ</sup> AoO < 20 km <sup>2</sup> or number of locations ≤ 5 <sup>Ⓜ</sup>

### Evidence:

#### Eligible under Criterion D as Endangered

It is estimated that there are 150 to 300 mature individuals.

**Criterion E (Quantitative Analysis) was not addressed as the taxon does not have a detailed Population Viability Analysis.**

### References

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