Threatened Species Assessment

Caladenia orientalis
Eastern Spider-orchid

Taxonomy

Caladenia orientalis (G.W. Carr) Hopper & A.P. Br.

Other scientific names include *Arachnorchis orientalis, C. fragrantissima* subsp. *orientalis* and *C. patersonii* var. *arenaria*. The taxon hybridises with *C. tessellata* to form the named hybrid *C.* X *variabilis.* Old records of *C. patersonii*' from near Bairnsdale and Marlo are here tentatively included in *C. orientalis*, although plants have not been seen in the wild for many years and their identity is uncertain (Backhouse et al. 2016).

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* as *Caladenia fragrantissima* ssp. *orientalis* (SAC 1991).

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

Proposed conservation status

Endangered in Australia

Criterion A2ace+3ce+4ace; B1ab(i,ii,iii,iv,v)+2ab(i,ii,iii,iv,v); C1+2a(i)

Species Information

Description and Life History

The taxon is a deciduous orchid that dies back annually to a small, spherical, underground tuber. The single leaf is green, long and narrow. The erect hairy flower stem grows to 20 cm tall and has one or two large creamy white to pale yellow flowers to 80 mm across. The sepals and petals are up to 10 cm long and slender with long tips covered with dark red-brown glands. The central petal (labellum) is triangular with a rolled tip. The expanded part of the labellum has four rows of short red glands and the sides are fringed with moderately long thickened teeth decreasing in size and extending almost to the labellum tip. The taxon flowers from September to November and is followed by summer dormancy. Individuals may have many years between flowering events and periodic fire is required to stimulate flowering and seed production. Long-term results from demographic monitoring suggests that this taxon is likely to require fire intervals of between five and fifteen years for survival. The orchid is a winter active geophyte with emergence occurring in concert with cooler conditions and onset of winter rainfall (TSSC 2016). The taxon flowers best in the spring after a hot summer fire, with numbers of flowering plants then decreasing as the dense heathy habitat regrows. (Backhouse et al. 2016).

All subpopulations usually have very low numbers of flowering plants each year, with some subpopulations not flowering in some years. However, the taxon flowers in abundance in the year or 2 after a summer bushfire (and providing there are favourable environmental conditions in the following autumn and winter to stimulate flowering), when many tens to hundreds of flowering plants have been seen. These events are very infrequent, perhaps occurring only once every 2 or 3 decades or more.

Spider-orchids, in general, use either food deception or sexual deception for pollination, the usual pollinators are male wasps from the family Thynnidae. 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).

Spider-orchids generally reproduce from seed. The fruits normally take 5-8 weeks to reach maturity following pollination and each mature capsule may contain tens of thousands of microscopic seeds that are dispersed by the wind when the capsule dries out. Most spider-orchids grow in a complex relationship with mycorrhizal fungi which is critical for growth and development. The fungus assimilates some nutrients for the orchid, but the degree of nutritional dependence upon the fungus by spider-orchids is not clearly understood. Some spider-orchids have survived for at least 17 years in the wild, however longevity of most taxa is not known (DSE 2000).

Generation Length

The generation length of *Caladenia orientalis* 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 endemic to Victoria, where it occurs mainly in South Gippsland between Wonthaggi and Yarram, and possibly as far east as Marlo, with a single record from Rosebud on the Mornington Peninsula. Several hundred plants flowered at Wilsons Promontory in the spring of 2009 after a summer bushfire earlier that year (Backhouse et al. 2016).

In 2010, the historical distribution included coastal habitats from the eastern shore of Port Phillip Bay to Yarram in South Gippsland. This taxon was extinct on the Mornington Peninsula, Yarram-Hedley region, and the Latrobe Valley, and was distributed between Port Campbell and Yarram, with six populations containing an estimated 350 individuals known within this range (TSSC 2016).

Habitat

The taxon grows in coastal heathland and heathy woodland on deep sandy and sandy loam soils. The altitude ranges from 20 to 160 metres above sea level. Plants growing in more open areas such as around rock outcrops and along tracks flower in most years despite the absence of fire (Backhouse et al. 2016).

Threats

There has been a historic decline in distribution and abundance. There are old records of the taxon from Wonthaggi, Toora, Headley, and Yarram, however plants have not been seen at these localities for many decades. Some plants occurred on private land at Cape Patterson, and it is not known if these have been lost. All other subpopulations occur on protected public land.

Subpopulations and habitat may be at risk from disturbance and increasingly dry conditions from declining rainfall and consequent increase in severity and intensity of bushfires, especially the subpopulations in Wilsons Promontory National Park due to planned burning. Very small subpopulations are highly susceptible to stochastic events causing major decline or local extinction within a very short time frame.

The taxon is subject to trampling by recreational users and land clearance for residential development, with populations around Wonthaggi being lost or at great risk from expanding residential development on the south coast (Backhouse et al. 2016; TSSC 2016). The timing and frequency of fire is a known threat, specifically it has been suggested that a fire interval of 5-15 years is required to stimulate sufficient flowering and subsequent seed set for the survival of populations.

Additionally, the taxon is threatened by weed invasion, predominantly related to large increases in the cover of tall shrubs. Problem weeds include Veldt Grass (*Ehrharta longifolia*), Large Quaking Grass (*Briza maxima*), Bridal Creeper (*Asparagus asparagoides*) and Boneseed (*Chrysanthemoides monilifera* subsp. *monilifera*) (TSSC 2016).

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%

A1 Population reduction observed, estimated, inferred or suspected in the past and the causes of the reduction are clearly reversible AND understood AND ceased.

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.

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*]

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.

based on any of the following:

(a) direct observation [*except A3*]

(b) an index of abundance appropriate to the taxon

(c) a decline in area of occupancy, extent of occurrence and/or quality of habitat

(d) actual or potential levels of exploitation

(e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites

Evidence:

Eligible under Criterion A2 as Endangered

The population reduction over the past 60 to 120 years is inferred to be 50 to 85% (midpoint 70%), based on (a), (c) and (e) above.

This is most likely due to extensive habitat loss for agriculture and residential development.

Eligible under Criterion A3 as Endangered

The population reduction over the next 60 to 100 years is projected to be 15 to 60% (midpoint 50%), based on (c) and (e) above.

Future decline is based on the risk to subpopulations and habitat from disturbance, weed invasion, residential development, increasingly dry conditions from declining rainfall, and a consequent increase in the severity and intensity of bushfires.

Eligible under Criterion A4 as 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 15 to 75%, based on (a), (c) and (e) above.

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 km²	< 5,000 km²	< 20,000 km²
B2. Area of occupancy (AOO)	< 10 km²	< 500 km²	< 2,000 km²
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 2,637 km², based on accepted, post-1970 records in the Victorian Biodiversity Atlas (VBA).

The Area of Occupancy (AoO) is estimated to be 44 km², based on 2 x 2 km grids derived from accepted, post-1970 records in the VBA.

Considering the limited dispersal ability of the taxon, the barriers to dispersal, and lack of habitat separating them (due to historical clearing for agriculture and residential development), the subpopulations can be considered to be severely fragmented. This precludes the possibility of recolonisation in the event of local extinction of subpopulations.

It has a continuing decline in (i), (ii), (iii), (iv) and (v) 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 C1 or C2				
C1	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)
C2	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				

Evidence:

Eligible under Criterion C1 as Endangered

It is estimated that there are 170 to 350 mature individuals. There is estimated to be a continuing decline of 5 to 20% within two generations.

Eligible under Criterion C2 as Endangered

It is estimated that there are 170 to 350 mature individuals, the number of mature individuals is projected to continue to decline based on the risk to subpopulations and habitat from disturbance, and the number of mature individuals in each of the eight subpopulations is fewer than 250.

Criterion D. Very small or restricted population			
	Critically Endangered	Endangered	Vulnerable
Number of mature individuals (observed or estimated)	<50	<250	<1,000
D2 Only applies to the VU category 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.	-	-	D2. Typically: AoO <20 km2 or number of locations ≤5

Evidence:

Eligible under Criterion D as Vulnerable

It is estimated that there are 170 to 350 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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