

Caladenia formosa Elegant Spider-orchid

Taxonomy

Caladenia formosa G.W. Carr

The taxon is also referred to by the scientific name *Arachnorchis formosa*. The taxon readily hybridises with *C. cardiochila*, *C. tentaculata* and *C. venusta*, producing colourful, variable hybrid plants. A couple of populations attributed to *C. formosa* have mostly pale red to pink flowers and may consist largely of hybrid plants (Backhouse et al. 2016).

Current conservation status

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

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

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

Proposed conservation status

Critically Endangered in Victoria

Criteria A2ace+3ce+4ace

Species Information

Description and Life History

The taxon is an herbaceous perennial geophyte which is 20-60 cm high, with a single leaf 8-15 cm long and a single (rarely two) flower. It is a deciduous orchid that dies back annually to a small, spherical, underground tuber. The single leaf is long and narrow, reddish-green and hairy. The erect hairy flower stem grows 20-60 cm tall and the flower is uniformly pinkish red to deep blood-red, up to 6 cm across. The sepals and petals are up to 8 cm long and slender, with long thin tips covered with blackish glands; the uppermost sepal is erect, the petals and lateral sepals spreading and drooping. The central petal (labellum) is narrowly triangular with the tip rolled under and paler at its base. The expanded part of the labellum has four to six rows of short blackish fleshy lumps and the sides are fringed with moderately long thickened teeth decreasing in size and extending almost to its tip. The taxon flowers from September to October, followed by a summer dormancy (Backhouse & Jeanes 1995; TSSC 2016; VicFlora 2015).

The populations growing in heathy vegetation are mostly seen flowering after bush fires, with numbers of flowering plants declining in subsequent years. At more open sites, the taxon flowers in most years (Backhouse et al. 2016). The taxon is a winter active geophyte that emerges in concert with cooler conditions and onset of winter rainfall. The role of fire in the ecology of the orchid is unknown. The specific pollinator of the orchid is unknown (TSSC 2016).

Spider-orchids, in general, use either food deception or sexual deception for pollination, the usual pollinator is 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.



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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.

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 the removal of surrounding vegetation and reduced competition as any chemical effect of the fire. 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. Flowering is often aborted when periods of sustained hot, dry weather follow flower opening.

Generation Length

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

Distribution

The taxon is distributed in south-western Victoria between Cavendish and Dorodong (Backhouse et al. 2016). The historical distribution is presumed to have included areas in western Victoria and southeast South Australia with 400-500 mm annual rainfall within the Naracoorte Plain bioregion.

Habitat

The taxon is typically found in heathy and grassy forest and woodlands on well-drained, often seasonally damp, sandy and clay loam soils. The flat country supports *Eucalyptus leucoxylon* (Yellow Gum) and *E. macrocarpa* (Grey Box) with a low, shrubby understorey. The altitude range is 100-300 metres above sea level (Backhouse & Jeanes 1995; Backhouse et al. 2016; TSSC 2016). It is found in a number of Victorian Ecological Vegetation Classes (EVCs), including the damp sands herb-rich woodland, plains sedgy woodland, shallow sands woodland and seasonally inundated shrubby woodland (TSSC 2016).

Threats

The taxon was almost certainly once more widespread and abundant, but much of its habitat has been cleared for agriculture and pine plantations. Regular monitoring of several populations since 1999 indicates a slow decline in numbers of remaining plants, probably due to warmer, drier conditions prevailing over much of the last two decades (Backhouse et al. 2016).

Subpopulations and habitat are considered at risk from disturbance, weed invasion, predation and increasingly dry conditions from declining rainfall and a consequent increase in severity and intensity of bushfires. In addition, very small subpopulations are highly susceptible to stochastic events causing major decline or local extinction within a very short time frame.

Weed invasion is a significant threat to the taxon, problem weeds include bridal creeper (*Asparagus asparagoides*), golden wattle (*Acacia longifolia*), common olive (*Olea europaea*), perennial veldt grass (*Erharta calycina*) and African weed orchid (*Disa bracteata*). The taxon is subject to habitat loss, disturbance and modification, specifically, rubbish dumping, road works and gravel dumping, altered hydrology, land clearance for agriculture and trampling. Additionally, rabbit grazing and cattle grazing (includes trampling of individual plants and weed introduction into the habitat) pose a threat to the taxon. Potential threats include the timing and frequency of fires (such as fires that occur in autumn, winter and spring, after the taxon shoots but before seed is set) and hybridisation (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%
<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><i>based on any of the following:</i></p> <ul style="list-style-type: none"> (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 Critically Endangered

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

Past decline based on the historic decline in the number of subpopulations and extensive loss of habitat due to clearance for agriculture and pine plantations (Backhouse et al. 2016).

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

Eligible under Criterion A3 as Critically Endangered

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

Monitored subpopulations are in decline, which would almost certainly apply to all subpopulations. Subpopulations and habitat are considered at risk from disturbance, weed invasion, predation and increasingly dry conditions from declining rainfall and a consequent increase in severity and intensity of bushfires. In addition, very small subpopulations are highly susceptible to stochastic events causing major decline or local extinction within a very short time frame.

Eligible under Criterion A4 as Critically Endangered

The population reduction over any 60 to 120 years period, including both past and future (up to 100 years in the future), is projected to be 60 to 90% (likely 80%), based on (a), (c) and (e) above. The causes of reduction may not have ceased 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 (EEO)	< 100 km ²	< 5,000 km ²	< 20,000 km ²
B2. Area of occupancy (AOO)	< 10 km ²	< 500 km ²	< 2,000 km ²
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 3,468 km², based on accepted, post-1970 records in the Victorian Biodiversity Atlas (VBA).

The Area of Occupancy (AoO) is estimated to be 36 km², based on 2 x 2 km grids derived from accepted, post-1970 records in the VBA.

The taxon is estimated to be severely fragmented and is estimated to have two locations. It has a continuing decline in (i), (ii), (iii), (iv) and (v) above, based on the risks from disturbance, weed invasion, predation and increasingly dry conditions from declining rainfall and a consequent increase in severity and intensity of bushfires.

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 Endangered

It is estimated that there are 600 to 1,200 mature individuals. The taxon is known from at least 8 widely separated and mostly small subpopulations, with fewer than 1200 plants in total.

In 2010, the small area between Cavendish in eastern Victoria contained an estimated 450 individuals across 14 populations, with the majority found in two Victorian populations. New populations have been found in Black Range State Park, Meereek State Forest and Mageppa Bushland Reserve but the numbers of plants at these sites and their status are unknown (TSSC 2016).

There is projected to be a continuing decline of 45 to 70% within two generations.

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 km ² or number of locations ≤ 5 [Ⓜ]

Evidence:

Eligible under Criterion D as Vulnerable

It is estimated that there are 600 to 1,200 individuals, and the taxon is estimated to be very restricted.

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

References

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