Threatened Species Assessment

Caladenia hastata
Mellblom's Spider-orchid

Taxonomy

Caladenia hastata (Nicholls) Rupp

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 1991).

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

Proposed conservation status

Critically Endangered in Australia

Criteria A2ace+3ce+4ace; C2a(i,ii); D

Species Information

Description and Life History

The taxon is a flowering plant 20-35 cm high. Leaf 8-12 cm long, 2-10 mm wide. Flowers usually solitary (sometimes 2 or 3); perianth segments 2-4 cm long, usually white, or sometimes cream with reddish stripes; lateral sepals and petals stiffly spreading, flattened at base, 2-5 mm wide, tapered to a filiform, clubbed tail, club usually 2-3 times wider than subtending segment, 10-22 mm long, with purple-black, contiguous, sessile glands. Labellum curved forward with recurved apex, lamina ovate, 3-lobed, 14-16 mm long and 10-12 mm wide (when flattened), white with purple markings; marginal calli linear to foot-shaped, to 2 mm long, diminishing in size towards broadly toothed mid-lobe; lamina calli in 4 or 6 crowded rows extending to base of mid-lobe, narrowly club-shaped to foot-shaped, to 1.5 mm long at base of lamina, decreasing in size towards apex. Characterized by the prominent, long black clubs on both petals and sepals, and its otherwise whitish flowers (VicFlora 2018).

The orchid is a winter active geophyte with emergence occurring in concert with cooler conditions and the onset of winter rainfall. Flowering occurs from October to late November and is followed by summer dormancy. Flowering is promoted strongly by hot fires during the previous summer. The usual pollinators for spider-orchids are male wasps from the family Thynnida, and the pollinator of the taxon was discovered to be *Lestricothynuus hastata*. Some individuals of this taxon are known to have survived at least 17 years in the wild, while other reports suggest that they have survived for over 25 years in the wild (TSSC 2016).

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 (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 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, which is often aborted when periods of sustained hot, dry weather follow flower opening (DSE 2000).

Generation Length

The generation length of *Caladenia hastata* 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 is known only from the far south-west between Portland and Nelson and extending inland to Wilkin (Backhouse et al. 2016). It is known from just 4 subpopulations with fewer than 40 plants, occurring at 2 locations. All subpopulations have very low numbers of flowering plants each year, with some subpopulations not flowering in some years. There has been an extensive historic decline in distribution and abundance, and the number of subpopulations is continuing to decline.

The original distribution and abundance are not clearly known. One location, at Point Danger, was mostly destroyed for construction of an aluminium smelter in the 1980s. In 2000, the taxon was known from one site with an estimated 20 plants, and by 2010 an additional four populations had been located, with an overall estimated number of 40 plants. These populations occurred in the Point Danger Coastal Reserve, Wilkin Flora Reserve, Discovery Bay Coastal Park, and Lower Glenelg National Park and include the aluminium smelter site. This increase in number of plants is likely the result of intensive recovery work supported by the owners of the aluminium smelter (TSSC 2016).

Habitat

The taxon grows in dense damp coastal heathlands and heathy woodlands on deep, well-drained sandy loam soils, usually on the margins of swampy depressions. The altitude ranges from 25 to 75 metres above sea level. The overstorey is dominated by *Eucalyptus willisii* (Will's Peppermint) and *E. baxteri* (Brown Stringybark), with an understorey of *Xanthorrhoea australis* (Grass Tree), *Dillwynia glaberrima* (Smooth Parrot-pea), *Acacia myrtifolia* (Myrtle Wattle), *A. longifolia* subsp. *sophorae* (Coast Wattle), *A. pycnantha* (Golden Wattle), *Banksia marginata* (Silver Banksia), *Leucopogon parviflorus* (Coast Beard Heath) and *Astroloma conostephioides* (Flame Heath) (Backhouse et al. 2016; TSSC 2016).

Threats

Threats to the taxon, especially at the coastal localities, include disturbance, weed invasion and increasingly dry conditions from declining rainfall. 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, including Coast Wattle, Boneseed (*Chrysanthemoides monilifera* subsp. *monilifera*) and biomass accumulation. The taxon is subject to threats from road maintenance activities, pollution due to fluoride emissions from the aluminium smelter at Point Danger, and land clearance for development due to the construction of the aluminium smelter. Additionally, the taxon is subject to grazing by rabbits and native herbivores, including the Eastern Grey Kangaroo (*Macropus giganteus*) and the Swamp Wallaby (*Wallabia bicolor*). A lack of pollination poses a threat to two populations, which are isolated from the taxon's natural pollinator by vegetative barriers of thick stands of Coast Wattle and Coast Tea-tree. A potential threat includes the timing and frequency of fires, including fires that occur in autumn, winter, and spring after the taxon shoots but before seed is set (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 Critically Endangered

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

Past decline is based on the recent and historic loss of subpopulations, and the degradation of habitat through clearing, weed invasion, and disturbance.

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 10 to 80 %, based on (c) and (e) above.

Future decline is based on a continuing decline in the numbers of plants, subpopulations, and habitat conditions. 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 inferred to be 40 to 95 %, based on (a), (c) and (e) above. The causes of reduction may not have ceased, be understood or be reversible.

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 1,180 km², and the Area of Occupancy (AoO) is estimated to be 12 km², based on 2 x 2 km grids derived from accepted, post-1970 records in the Victorian Biodiversity Atlas (VBA).

The taxon is estimated to be severely fragmented, has 2 locations, and 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 C2 as Critically Endangered

It is estimated that there are 10 to 40 mature individuals, the number of mature individuals is inferred to continue to decline, and the number of mature individuals in each subpopulation is 50 or fewer.

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 Critically Endangered

The taxon is estimated to have 10 to 40 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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