Threatened Species Assessment

Thelymitra mackibbinii
Brilliant Sun-orchid

Taxonomy

Thelymitra mackibbinii F. Muell.

The taxon was once thought to be a natural hybrid, but it is currently recognised as a species (VicFlora 2018).

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 2001).

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

Proposed conservation status

Critically Endangered in Victoria

Criteria A3ce+4ace; C2a(i); D

Species Information

Description and Life History

The taxon has an erect, purplish flowering stem, 15-30 cm tall and 2-3 mm wide, with 1-3 flowers. The single leaf is linear, 7-11 cm long, 4-9 mm wide, shallowly furrowed and dark green. Sepals and petals are ovate to lanceolate, 10-15 mm long, violet with purplish tips and with strong darker longitudinal veins. The taxon flowers in September and October, though flowers are few. The flowers open freely and are long-lasting (VicFlora 2018).

Little is known of the biology or ecology of the taxon. Pollination occurs through simple food deception and, like many other sun-orchids, the taxon is probably capable of self-pollination (Duncan & Coates 2010).

Generation Length

The generation length of *Thelymitra mackibbinii* is suspected 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 considered endemic to Victoria despite some sources suggesting the taxon also occurs in South Australia. It is sporadically distributed across central and western Victoria. where it is currently known from two sites between Stawell and St Arnaud, in the Victorian Midlands IBRA bioregion. Specifically, the taxon is currently known from only two populations: one in Deep Lead Nature Conservation Reserve near Stawell containing 10 plants, and a second at Mt. Bolangum Nature Conservation Reserve near Marnoo containing 12 plants. Both sites are managed by Parks Victoria. The historical range of the taxon is unknown, but it is likely to have been more common in central and western Victoria prior to land clearing. Plants have not been seen at the type location near Maryborough in central Victoria for over 100 years. Other reported occurrences have been near Bendigo and

Ballarat, but no plants have been seen in the last decade in these locations (DSE 2003; Duncan & Coates 2010). Dale Tonkinson (pers. obs.) also recorded the taxon at Mt Beckworth near Clunes in the 1980s.

Habitat

The taxon grows in open forest dominated by *Eucalyptus leucoxylon* and sometimes *Allocasuarina verticillata*, with a heathy understorey typically consisting of *Acacia paradoxa, A. montana* and *Pultenaea largiflorens* on well-drained, shallow, light brown silt with quartz and lateritic lag deposits (Duncan and Coates, 2010; VicFlora, 2018). The critical habitat has not been determined but is likely to require an undisturbed ground layer well covered by leaf litter (DSE 2003).

Threats

There has almost certainly been an extensive reduction in distribution and abundance of this taxon, based on the known and likely loss of subpopulations and the historical extensive loss and degradation of woodland habitat across its range, which is likely to have led to the loss of more subpopulations. Duncan and Coates (2010) noted that much of the woodland habitat of the taxon has been cleared for agriculture, with remaining patches having a long history of disturbance from gold mining and forestry operations. At least two subpopulations, near Maryborough and Ballarat, disappeared many decades ago. Plants have not been seen at the Brimpaen, Big Tottington and Dalyenong subpopulation localities for over twenty years now and it is not known if these subpopulations still persist. The habitat at the two largest subpopulations has declined from disturbance. It is possible that only two subpopulations, containing fewer than 40 plants, currently survive.

According to Duncan and Coates (2010), the remaining populations occur in relatively weed-free habitats, although face a variety of current and potential threats. Habitat quality at all subpopulation localities is likely to decline from increasingly dry conditions due to declining rainfall, leading to further decline in distribution and abundance of the taxon. It is likely that the conditions for maintenance of the pollinator and/or mycorrhizal fungi have been adversely affected at some sites. Additionally, grazing by native and introduced herbivores is a threat at the Mt. Bolangum site. There is also a high potential for disturbance/destruction by off-road vehicles and accidental trampling by people. All subpopulations are very small and are subject to stochastic events that could lead to a rapid decline or extinction within a very short time.

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 30 to 70%, based on (c) and (e) above.

Past decline is based on the known and likely loss of subpopulations and the historical extensive loss and degradation of woodland habitat across the range of the taxon.

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.

There is the possibility of a future decline in distribution and abundance, based on declining habitat conditions from increasingly dry conditions due to 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 80%, 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 1,282 km², based on accepted, post-1970 records in the Victorian Biodiversity Atlas (VBA).

The Area of Occupancy (AoO) is estimated to be 28 km², based on 2 x 2 km grids derived from accepted, post-1970 records in the VBA.

Considering the dispersal ability of the taxon, the barriers or lack of habitat separating them, the individuals can be considered to be severely fragmented.

A single location has been determined on the basis of similar habitat types and threats operating on all subpopulations.

It has a continuing decline in (i), (ii), (iii), (iv) and (v) above, based primarily on declining habitat conditions from increasingly dry conditions due to declining rainfall.

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 15 to 70 mature individuals. This is based on sporadic surveys and VBA records.

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 15 to 70 mature individuals.

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

References

DEPI (2014). *Advisory list of rare or threatened plants in Victoria - 2014.* Department of Environment and Primary Industries, Melbourne. Retrieved from:

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