Threatened Species Assessment

Thelymitra epipactoides
Metallic Sun-orchid

Taxonomy

Thelymitra epipactoides F. Muell.

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

Endangered in Victoria

Criteria A2ac+3c+4ac; C1

Species Information

Description and Life History

The taxon has a flowering stem erect, stout, straight, 20-50 cm tall, 2-6 mm diam., green or purplish. Leaf linear to linear-lanceolate, 18-30 cm long, 10-30 mm wide, flattish, fleshy, canaliculate, ribbed abaxially, sheathing at base, dark green with a purplish base. Inflorescence 5-25-flowered. Sterile bracts 1-3, large, leaf-like. Perianth segments ovate to ovate-lanceolate, 10-20 mm long, thick-textured, pink, bronze, green, blue or reddish, often with a coppery sheen. Column ovoid, 5-8 mm long, same colour as perianth but often paler; mid-lobe expanded into an incurved, semi-circular ridge, 2-3 mm long, 1-1.5 mm wide, purplish-brown, attenuated, rising over the anther and higher than the lateral lobes, the yellow tip finely toothed or incised; auxiliary lobes usually incurved and often interlocking, more or less flat, strap-like, apex irregularly toothed, yellow; lateral lobes converging, filiform, obliquely erect, hair-tufts in a long tooth-brush like arrangement, white. Anther inserted towards base of column, apex ending in a moderately long beak. The taxon flowers from September to November. Leaves appear in winter and plants flower in September to November setting seed and going dormant in early summer. Flowers open freely on warm days and are insect-pollinated (VicFlora, 2014).

The taxon is readily identifiable by the robust habit, large fleshy leaf, thick stem and crowded flowers with broad flat auxiliary lobes and spreading hairs on the lateral lobes of the column. A feature of this species is the wide colour variation within populations, with the colour of individual plants ranging from bluish to green to bronze to pink to reddish. It is the only sun-orchid in Victoria to have such widely varying colour in the one population (Backhouse et al., 2016).

Some populations, especially in heathy habitats, appear to require periodic fire to initiate flowering. The pollinator of *T. epipactoides* flowers is a small native bee, *Nomia* sp. that is attracted to the flowers by strong perfumes and/or rewards of nectar (Cropper, 1993). The pollination rate is unknown, but it appears that *T. epipactoides* has optimised the chance of pollination by evolving a range of colour morphs (Cropper, 1993; Duncan and Coates, 2010). Flowers open freely on warm days and seeing a large population in flower is an experience not soon forgotten. In dense heathy habitats, flowering is enhanced by summer fires, but on more open sites plants flower regularly without fire. Extensive ecological studies were carried out on a population of the taxon on the coast near Port Campbell during the 1980s. These studies indicated that the species appears to be pollinated preferentially by a small native bee Nomia species that collects pollen as a food for its larvae. The bee is lured to the flowers

seeking pollen, possibly fooled by the large auxiliary lobes that are tented over the hair tufts. The remarkable colour variation exhibited by *T. epipactoides* is a thought to be a strategy to increase attractiveness to the bee that would otherwise learn to avoid flowers of a similar colour that consistently fail to yield any pollen (Backhouse et al., 2016). Following recent wildfires in the Grampians region, a few hundred plants flowered the first season following the fire. In the second season following the fire, only the odd plant was observed.

Generation Length

The generation length of *Thelymitra epipactoides* is estimated to be 20 to 40 (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, each individual is 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. Visible ramets essentially represent distinct genets, since a single leaf emerges each year from an annually replaced tuberoid (although very occasionally), usually in response to minor subterranean injury. Two daughter tuberoids are produced instead of the normal one tuberoid, resulting in two ramets in very close proximity. However, it is to monitor numbers since seedlings may also occur in very close proximity.

Distribution

The taxon is widespread but sporadic across southern and western Victoria, west from the Gippsland Lakes. Specifically, the taxon is sporadically distributed from the Eyre Peninsula in South Australia to central Gippsland in Victoria. The altitude ranges from 0-160 metres ASL (Backhouse et al. 2016; Duncan and Coates, 2010). Two populations totalling a few hundred plants flowered following bushfires in the Grampians region, and these populations were not known at the time of publication of Duncan and Coates (2010).

Habitat

The taxon occurs in a wide variety of habitats including coastal heathland, grasslands, heathy and shrubby woodlands and open forest, sometimes around swamp margins. The taxon extends further inland into similar habitats in the western part of its range. Substrates may be moist or dry sandy loams, light sand over clay and heavier terra rossa soils over limestone (Duncan and Coates, 2010; VicFlora, 2014). Backhouse et al. (2016) report that the taxon occurs on sandy to clay loam to peaty, often seasonally damp soils.

Threats

Although the taxon remains widely distributed, it has suffered a substantial decline in range and abundance. Much of its habitat, especially in western Victoria, has been cleared for agriculture, while heathy habitat in coastal areas has been cleared for residential development. There are historical records of *T. epipactoides* close to Melbourne (Epping and Beaumaris), but these populations were lost decades ago. Plants have not been seen at the Glenelg National Park (NP) site for about 15 years, while the populations in Mocambar Forest Reserve declined from about 60 plants to just 10 plants. There is a high risk of extinction of many populations due to the tiny population sizes and the highly fragmented distribution. It is likely that the conditions for maintenance of the pollinator and/or myccorhizal fungi have been adversely affected at some sites, especially as pollination in very small populations is almost non-existent (Duncan and Coates, 2010; NOSSA, 2009).

The remaining populations of *T. epipactoides* face a variety of current and potential threats. Grazing by kangaroos and rabbits/hares is a serious threat at the Lake Mundi Wildlife Reserve (WR), Port Campbell NP, Blond Bay WR, Kiata FFR (now fenced), Gippsland Lakes Coastal Park (CP) (now fenced), and Bay of Islands NP sites. A large variety of weed species are an existing or potential problem. Specifically, pasture grasses at the Bay of Islands CP site, *Cassinia* ssp. (Dogwood) and *Romulea rosea* var. *australis* (Onion grass) have appeared in large numbers since the last fire at the Port Campbell NP site (Duncan and Coates, 2010).

There is potential accidental disturbance to or destruction of plants and/or habitat at many sites. There is the risk of accidental trampling or destruction of plants by road/track maintenance activities at the Port Campbell NP (1) and Roadside (Golden Beach and Strathdownie) sites. Rubbish dumping has occurred in the vicinity of the Golden Beach roadside site. There is a risk of grazing or accidental trampling resulting from illegal stock grazing or escapees from surrounding farmland at the Bay of Islands CP site. There is a of accidental trampling or removal of flower spikes if a proposed walking track passes through the Port Campbell NP site. Alterations to current hydrology have the potential to adversely affect populations at the Lake Mundi WR, Golden Beach roadside, Blond

Bay WR, and Gippsland Lake CP sites. Plants from some populations have been illegally picked (Duncan and Coates, 2010).

Populations growing in dense heathy habitats probably rely on periodic summer wildfire to initiate flowering by temporarily reducing competition. Too frequent fire or fire at the wrong time, especially in spring, could damage plants and/or habitat. Absence of fire may mean reduced opportunities for flowering, seed production and establishment of new plants. Backhouse et al. (2016) report that the taxon occasionally occurs on peaty soils. Under extreme fire conditions, peaty soils have the potential to smoulder and kill underground plant structures.

The flowering period of the taxon has been cut short by severe hot north winds on Eyre Peninsula in recent years (first recorded Oct and Nov 2006). Flowers have been observed opening once or twice and then wilting and shrivelling, instead of the traditional multiple reopening and closing of flowers throughout the flowering season. This renders the flowers unavailable for pollination and effectively finished for the year. Such interference in plant life cycle has been recorded in below average and above average rainfall years now, but seems more pronounced in below average drought years and in populations that persist in fragmented habitat (Duncan and Coates, 2010).

The taxon was once much more common but is now rare due to loss of habitat, with weed invasion, disturbance and grazing by rabbits threatening remaining populations (Backhouse et al., 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 estimated to be 75%, based on (a) and (c) above.

Past decline is based on widespread loss of past populations in the Wimmera, south-west Victoria, Western Otways and Melbourne region (see Duncan and Coates, 2010).

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

Eligible under Criterion A3 as Endangered

The population reduction over the next 60 to 100 years is projected to be 30 to 50%, based on (c) above.

Future decline is most likely due to habitat degradation or alteration, not from widespread clearance as has occurred in the past.

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 estimated to be 50%, based on (a) and (c) 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 B2 as Vulnerable

The Area of Occupancy (AoO) across the taxon's range is estimated to be 188 km², based on 2 x 2 km grids derived from accepted, post-1970 records in the Victorian Biodiversity Atlas.

The taxon is estimated to have eight locations.

It is inferred to have a continuing decline in (i), (ii), (iii), (iv) and (v) above, most likely due to habitat degradation or alteration.

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 1,750 to 3,500 mature individuals, based on Duncan and Coates (2010) and more recent observations following wildfires in the Grampians regions.

A continuing decline of 20 to 30% is estimated to occur 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 km2 or number of locations ≤·5

Evidence:

Ineligible under Criterion D

It is estimated that there are 1,750 to 3,500 mature individuals.

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

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