Threatened Species Assessment

Muellerina celastroides
Coast Mistletoe

Taxonomy

Muellerina celastroides (Sieber ex Schult. & Schult. f.) Tiegh.

Current conservation status

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

Proposed conservation status

Endangered in Victoria

Criteria B1ab(iii)+2ab(iii)

Species Information

Description and Life History

The taxon is an erect or spreading epiphytic and parasitic shrub, glabrous except inflorescence axes brown-tomentose. Leaves oblong to orbicular, mostly 2.5-7 cm long, 15-25 mm wide, flat, base attenuate, apex rounded or obtuse, green; venation pinnate, obscure; petiole 3-8 mm long. Inflorescence a raceme of 1-3 pairs of triads; peduncles of triads 5-7 mm long; pedicels of lateral flowers 2-6 mm long. Calyx entire or weakly toothed, limb to c. 0.5 mm long; corolla 22-35 mm long, greenish-red; anthers 1-1.5 mm long, free part of filament 8-13 mm long. Fruit pyriform, 7-11 mm long, green to pale red. The taxon flowers mainly in summer (VicFlora 2020).

Generation Length

The generation length of *Muellerina celastroides* is estimated to be 35 to 70 years. The taxon is a long-lived epiphytic shrubby parasite with a plausible longevity of several to many decades. Recruitment is likely to be more or less continuous throughout the interval between successive fire events which are estimated to have occurred at intervals of 45-90 years or more under pre-European settlement conditions. Like all aerial mistletoes, the taxon is fire-sensitive and all adult plants are killed by intense by intense crown fires.

Distribution

The taxon is confined in Victoria to coastal areas east from Sale to the New South Wales border at Cape Howe, and also occurs in Queensland, and New South Wales (VicFlora 2020). Pre-1902 specimens at interstate herbaria purporting to have been collected at Hawkesdale, Werribee, and north-east of Oakleigh are of doubtful provenance and, if reliably located, assumed to be long extinct.

Habitat

The taxon occurs as a parasite mostly on taxa of *Banksia* and *Allocasuarina* (VicFlora 2020). Whilst the most common host in Victoria is *Banksia integrifolia* (Coast Banksia), the taxon has also been recorded on *Banksia serrata* (Saw Banksia) and *Monotoca elliptica* (Tree Broom-heath). All locationally accurate records are strictly coastal where typically associated with Dune Scrub or Coast Banksia Woodland on coastal dune systems or coastal escarpments.

Threats

The taxon is threatened by fire which can incinerate adult plants and reduce the availability of adult host plants which are, in turn, threatened by intense fire events.

The taxon may also be threatened by extreme drought stress which may lead to branch shedding by host trees, particularly taxa of *Banksia*, and also to adult mortality of the mistletoe itself. Given the demonstrated susceptibility of *Banksia* taxa to infection by the pathogen *Phytophthora cinnamomi*, the taxon may also be threatened by *P. cinnamomi* infection and death of the host tree. *P. cinnamomi* has been observed to result in death of susceptible trees and shrubs in the Mallacoota district since at least the early 1970s (David Cameron pers. obs.) with demonstrable spread westward along the coast toward Wingan Inlet.

Climatic drying and warming has demonstrably increased the intensity, frequency, and landscape scale of intense fire events across the Victorian range of the taxon, a significant proportion of which has been burned in the 2019-2020 fire season. Repeat fire at intervals approaching or below the tolerable fire interval for the taxon is an increasing threat, resulting in recruitment failure and local extinction.

A significant proportion of Victorian occurrences are in coastal dune habitats strictly at sea level. These are further threatened by sea level rise and increasing coastal instability which have the demonstrated capacity to eliminate the dune substrate to expose rocky bedrock and erode and undercut coastal cliffs.

Given the fleshy foliage of the taxon, some occurrences may be susceptible to targeted or incidental browsing by Sambar Deer (*Rusa unicolor*) or Hog Deer (*Axis porcinus*) which have the demonstrated ability to use their antlers to drag tree and shrub canopies, particularly those entangled by vines such as *Tetragonia implexicoma* (Bower Spinach), to the ground to access elevated foliage and stems.

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:

Ineligible under Criterion A

There is insufficient evidence to determine whether there has been or will be a reduction in population sufficient to meet any threshold for Criterion A.

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 B1 as Endangered

The Extent of Occurrence (EoO) across the taxon's range is estimated to be 2,410 km², based on accepted, post-1970 records from the Victorian Biodiversity Atlas (VBA).

The taxon is estimated to be severely fragmented at the landscape scale. Despite the fruit being bird-dispersed, it is unlikely that individual subpopulations would be successfully recolonised following local extinction since most subpopulations are likely to occur at separations exceeding the dispersal range of the taxon, which is based on the home range of vectors such as the Mistletoe Bird which typically has a home ranges of only 20 hectares (Ward & Paton 2007).

It is estimated to have one location, and has a continuing decline in (iii) above in response to the current and projected impacts of the identified threats, such as extreme drought stress, *Phytophthora cinnamomi* infection, climatic drying and warming, repeat fire, sea level rise, and browsing and damage by deer.

Eligible under Criterion B2 as Endangered

The Area of Occupancy (AoO) across the taxon's range is estimated to be 84 km², based on 2 x 2 km grids derived from accepted, post-1970 records in the VBA. As above, it is severely fragmented, has one location and has a continuing decline in (iii) 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:

Ineligible under Criterion C

There is no record of population size for any Victorian occurrence, although field observation and the consistently low projective foliage cover recorded in all quadrat sites suggest population density is consistently low.

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 D2 as Vulnerable

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

DEPI (2014). *Advisory list of rare or threatened plants in Victoria - 2014.* Department of Environment and Primary Industries, Melbourne. Retrieved from: https://www.environment.vic.gov.au/__data/assets/pdf_file/0021/50448/Advisory-List-of-Rare-or-Threatened-Plants-in-Victoria-2014.pdf

VicFlora (2020) Flora of Victoria, Royal Botanic Gardens Victoria: *Muellerina celastroides* Retrieved from: https://vicflora.rbg.vic.gov.au/flora/taxon/75569a04-b255-44e7-b2c9-8b0e6cac4051

Ward, M.J. & Paton, D.C. (2007). Predicting mistletoe seed shadow and patterns of seed rain from movements of the mistletoe bird, *Dicaeum hirundinaceum*. *Austral Ecology* 32: 113-121.