Threatened Species Assessment

Phlegmariurus varius
Long Clubmoss

Taxonomy

Phlegmariurus varius (R. Br.) A.R. Field & Bostock

Current conservation status

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

Proposed conservation status

Critically Endangered in Victoria

Criteria C1+2a(i)

Species Information

Description and Life History

Stems erect or suberect, branching several times, 20-30 cm long. Leaves spirally arranged, close-set and overlapping, spreading, strap-shaped, 10-15 mm long, more than 1 mm wide, papery to firm, green to dark green. A variable species, intergrading between two growth forms: one epiphytic and pendulous (sometimes referred to P. myrtifolius, a species not found in Australia), the other growing in rock crevices and erect. Nearly all Victorian specimens fall within the latter category (VicFlora, 2017).

Generation Length

The generation length of *Phlegmariurus varius* is inferred to be 5 to 25 years. Plants grown in cultivation have become fertile in five years, so this is therefore given as a minimum value for generation length. They are also known to survive for decades as cultivated plants.

Distribution

In Victoria the taxon is disjunct between the Grampians, the Otways, the Baw Baw area, Wilsons Promontory and far east Gippsland in Coopracambra National Park and Genoa Peak.

Habitat

The taxon is found in rock crevices.

Threats

Erosion and sedimentation following storm and flood events, habitat alteration, droughts, increased fire frequency and intensity, climate change and to a lesser extent invasive species

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 15 to 75 years is estimated to be 30 to 60%, based on (a) and (c) above.

Some subpopulations have been observed to have declined in recent years. Subpopulations along the Sealers Cove Walking Track have been disturbed by the flood events of 2011 with areas of suitable habitat being completely eroded away. The Mt Kaye subpopulation has been disturbed by fire. It is suspected that each of these subpopulations have at last decreased to half of their original sizes before the disturbance events. The fires of 2019/20 may have had significant impacts, especially at Genoa Peak.

.**Eligible under Criterion A3 as Endangered**

The population reduction over the next 15 to 75 years is projected to be 25 to 55%, based on (c) above.

These estimates are based on the continuation of threats that have led to past decline (e.g. erosion following flood events, droughts and fire damage).

Eligible under Criterion A4 as Endangered

The population reduction over any 15 to 75 year period, including both past and future, is estimated to be 30 to 60%, based on (a) and (c).

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 Area of Occupancy (AoO) is estimated to be 88 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. This species has a highly sporadic distribution with locations being separated by over 100 km of unsuitable habitat. Additionally, most subpopulations are small (likely to be less than 50 mature individuals).

It is estimated to have 5 locations. It 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 C1 as Critically Endangered

t is estimated that there are 165 to 716 mature individuals. There is uncertainty regarding the number of subpopulations due to insufficient information in the herbarium records. The minimum number of subpopulations could be 16, the maximum may be 25.

Assuming 16 subpopulations, the current population may be estimated at 165 individuals. This estimate is based on observed numbers of 20 and 25 plants for a Sealers Cove and Grampians population respectively, assumed extinction of two subpopulations with a single plant reported (Baw Baw area and Genoa Peak) and an estimate of 10 plants for each of the remaining subpopulations assuming the lower estimate of 16.

Assuming there are up to 25 subpopulations then the upper estimate of current individuals may be 716. This estimate assumes no extinction of subpopulations with those subpopulations reported to have a single individual retained at 1 individual, 30 individuals at the Sealers Cover Track subpopulation seen by the assessor, 25 for one of the Grampians subpopulations given as having 25 individuals and 30 plants for each of the remaining subpopulations.

There is an estimated continuing decline of 5 to 255 within one generation.

Eligible under Criterion C2 as Critically Endangered

it is estimated that there are 165 to 716 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 Vulnerable

It is estimated that there are 165 to 716 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.

VicFlora (no date). Flora of Victoria, Royal Botanic Gardens Victoria: *Phlegmariurus varius*. Retrieved from: https://vicflora.rbg.vic.gov.au/flora/taxon/436bdd8b-2c85-4e5c-9a4a-b0a0d6c2ea7e