Threatened Species Assessment

Ophioglossum reticulatum
Stalked Adder's-tongue

Taxonomy

Ophioglossum reticulatum L.

The distinction between this species and *O. lusitanicum* is rather nebulous. When the lamina is broad and membranous, the venation distinct and the sporangial spike long, *O. reticulatum* is clearly distinguished from *O. lusitanicum*, but plants exist with short spikes and leaves intermediate in texture and shape (VicFlora 2017).

Current conservation status

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

Proposed conservation status

Endangered in Victoria

Criterion A4ce; B2ab(i,ii,iii,iv,v)

Species Information

Description and Life History

The taxon is a perennial herb with plants 7-16 cm tall, with 1-3 fronds, apparently forming colonies. Rhizome erect, short, tuberous; roots few, brittle, spreading, sometimes with vegetative buds. Stipe fleshy, partly below ground, not persistent. Lamina 2-6 cm long, membranous, ovate to oblong-ovate; base broadly cuneate to truncate; veins distinct, forming network of areoles, free vein endings usually not evident. Spike 10-40 mm long when mature, on stalk up to 10 cm long, growing from base of sterile lamina; 11-28 pairs of sporangia per spike (VicFlora 2017).

Generation Length

The generation length of *Ophioglossum reticulatum* is inferred to be 20 to 70 (midpoint 45) years. There are reports of other *Ophioglossum* species at least 7 years old (Land 1911). Land (1911) also found that nearly all the plants in any colony were connected by adventitious roots, indicating that each plant in a colony is a ramet connected to other members of each genet. Since *O. reticulatum* is also colonial, it can be inferred that the clonal genet is likewise much older than the morphology of the individual ramet suggests. The genet may therefore be of indefinite longevity, limited only by disturbance events such as flood or excavation by animals. An estimate of generation length is therefore based on the plausible interval between flood and other localised disturbance events. The taxon is likely to recruit episodically in response to major disturbance events such as severe flooding or opportunistically in response to localised site disturbance events such as animal excavation.

Distribution

In Victoria the taxon is sporadically distributed across the east of the state in the Alpine region and in East Gippsland, with a disjunct record for Shelley in the North East and with lowland outliers in the Bairnsdale district near Iguana Creek and north of Nowa Nowa. It also occurs in Western Australia, Northern Territory, Queensland and New South Wales and cosmopolitan outside Australia.

Habitat

The taxon is restricted in Victoria to cool mountain forests where it grows on muddy verges of streams (VicFlora 2017). Site and specimen data indicate the taxon also occurs in riparian habitats in drier rainshadow valleys such

as near Licola and near Iguana Creek where it is often associated with *Eucalyptus bridgesiana* (But But), *E. melliodora* (Yellow Box) or even *E. polyanthemos* (Red Box). At Licola the taxon is consistently associated with *Leptospermum obovatum* (River Tea-tree), *Senecio diaschides* (Shingle Fireweed) and *Viola betonicifolia* subsp. *novaguineensis* (Floodplain Violet), strongly supporting the inference that the taxon occupies muddy verges of streams.

Threats

The taxon is a habitat specialist that is highly dependent on the hydrological and ecological stability of its riparian habitat. It is therefore highly susceptible to any disruption of its habitat.

Historically, the taxon suffered significant decline through habitat loss to agriculture in some districts, and habitat degradation from stock grazing, feral horses, diversion of stream flow into reservoirs and dams and forest management activities, resulting in pugging, erosion, siltation, weed invasion and reduced streamflow.

Current and future threats also include climatic drying and the increasing frequency, intensity and landscape scale of both bushfires and imposed fire regimes, resulting in both increased drought stress and extreme flood events. Riparian habitats are targeted by feral cattle, feral horses and pigs and, increasingly, by Sambar Deer. Some sites are also threatened by recreational activity, including the use of 4WD vehicles, trail bikes and other off-road vehicles. Riparian habitats are notoriously susceptible to invasion by a wide range of exotic weeds including species of *Rubus* Blackberry) and *Salix* (Willows).

The bushfires of 2019/2020 are believed to have impacted more than 80% of the taxon's habitat. The taxon is generally tolerant of fire, and the overall impacts of the fire are yet to be determined.

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 Vulnerable

The population reduction over the past 60 to 210 years is estimated to be 20 to 30%, based on (c) and (e) above.

This is based on the impact of historic threats, including habitat loss to agriculture and habitat degradation resulting mostly from agricultural activity.

Eligible under Criterion A3 as Vulnerable

The population reduction over the next 60 to 100 years is projected to be 30 to 50% (midpoint 40%), based on (c) and (e) above, based on the effects of the identified threats.

Eligible under Criterion A4 as Endangered

The population reduction over any 60 to 210 year period, including both past and future (up to 100 years in the future), is estimated to be 25 to 55% (midpoint 45%), based on (c) and (e) above.

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 Extent of Occurrence (EoO) across the taxon's range is estimated to be 13,321 km², based on accepted, post-1970 records from the Victorian Biodiversity Atlas (VBA).

Eligible under Criterion B2 as Endangered

The Area of Occupancy (AoO) across the taxon's range is estimated to be 54 km², based on 2 x 2 km grids derived from accepted, post-1970 records in the VBA.

The taxon reproduces by spores that are light weight and have the ability to be carried by air currents and hence have the propensity for long-distance dispersal. Almost all subpopulations are within 40 km of their nearest subpopulation which is a distance that may allow spores to recolonise sites if previously established subpopulations went extinct, especially considering the trans-oceanic dispersal that this taxon has potentially achieved. In highly dissected landscapes, however, the effective dispersal range is likely to be limited to individual river valleys.

At least two locations can be identified on the basis of elevation range which is likely to determine the intensity of a range of identified threats: one for occurrences at montane and tableland elevations in the Alpine region and one for occurrences at lower elevations. A third location may be identified for the disjunct occurrence at Shelley in the North East since this site may be subject to a distinct range of climatic conditions and also fire risk, since it is adjacent to a highly flammable exotic pine plantation estate. A fourth location may be identified for occurrences in

the Bairnsdale district which are associated with drier forest communities also subject to a distinct range of climatic conditions and fire risk.

It has a continuing decline in (i), (ii), (iii), (iv) and (v) above, based on the high risk of local extinction of at least some subpopulations in response to the impact of the identified threats.

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

No reliable estimates of the number of mature individuals present at sites of occurrence are available for the taxon in Victoria. Any estimate of the number of plants at any given site is likely to be a count of ramets rather than genets and likely to greatly overestimate the true number of mature individuals at the site.

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)

Land, W.J.G. (1911). A protocorm of Ophioglossum. *Botanical Gazette* 52: 478-479.

VicFlora (2017). Flora of Victoria, Royal Botanic Gardens Victoria: *Ophioglossum reticulatum.* Retrieved from: https://vicflora.rbg.vic.gov.au/flora/taxon/cdbd34ae-7ac6-453c-bce3-ff2483f9760e