Threatened Species Assessment

Psilotum nudum
Skeleton Fork-fern

Taxonomy

Psilotum nudum (L.) P. Beauv.

Current conservation status

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

Proposed conservation status

Endangered in Victoria

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

Species Information

Description and Life History

The taxon is a perennial plant which is either terrestrial or a lithophyte growing on rock (in Victoria), erect, compact, 30-60 cm high. Rhizome short, dichotomously branched, with thin rhizoids. Stems rigid, angular, branched repeatedly beyond main stem, dark green when young then yellow to bronze. Scales sparse, spirally arranged on stem-ridges, simple, elongate-deltoid, pointed, without veins, less than 3 mm long, green and fleshy when young then dry and colourless to brown. Synangium 1.5-3 mm diam., thick-walled, yellow; sporophylls produced in place of scales in younger parts of plant; spores released through 3 radial slits. Sporangia are produced in August to October. In the tropics, plants of this taxon are epiphytic on trees and palms (Vicflora 2020).

Generation Length

The generation length of *Psilotum nudum* is estimated to be 50 to 80 years. *P. nudum* has been noted as having long-lived gametophytes and sporophytes and has been shown to be able to be grown in a pot for anatomical research for 16 years (Parkinson 1987) suggesting that the lifespan is probably much longer than 16 years. Longevity is likely to exceed 80 years and generation length is likely to be at least 50 years.

Distribution

In Victoria the taxon is known only from Mt Arapiles, Mitre Rock and in the northern Grampians, with an isolated occurrence at Suggan Buggan on the Ballantyne Hills in the far north of East Gippsland. Also WA, NT, SA, Qld, NSW, Norfolk Island, New Zealand, Easter Island and tropical parts of all continents (VicFlora 2020). The taxon is pantropical and generally very common, occasionally escaping from glasshouses where it is often weedy in pots, particularly of palms and cycads.

Habitat

In Victoria the taxon is known only from dry, exposed rock crevices (VicFlora 2020). In the tropics it is usually epiphytic on trees and palms or near the root balls of trees in rainforest.

Threats

The taxon is likely to have suffered only negligible historic habitat loss but not insignificant habitat disturbance through recreational activity, such as rock-climbing and bushwalking, and weed invasion by exotics such as *Brachypodium distachyon* (False Brome). Ledge habitats are generally inaccessible to vertebrates such as goats,

rabbits, feral deer and stock and accessible only to birds. The taxon is also not likely to be targeted by vertebrate herbivores, as its vegetative parts are highly reduced compared to other larger-leaved flowering plants with which the taxon is associated. *P.nudum* is generally most abundant in wet and humid areas of the tropics, suggesting that it favours high moisture environments. The extreme habitat restriction observed at temperate latitudes is natural, not an artefact of European settlement, and reflects an evolutionary adaptation globally to either lithophytic or epiphytic habit. Rock crevices and ledges at Mt Arapiles occur in a complex topographic mosaic and tend to be east-facing, and are therefore more protected than the north-facing habitats at Mitre Rock and at the Ballantyne Hills. Fire is not likely to be a significant threat since fuel accumulation rates are low and fire is of patchy penetration and generally low intensity. Boulders and outcropping rock tend to insulate rhizomes in crevices from the heat of the fire. Despite the apparent drought tolerance of the taxon, prolonged and extreme drought events may exceed the drought tolerance of the taxon since such events are predicted to increase in frequency as a result of climatic drying and warming.

The greatest current threat to the taxon is likely to be invertebrate predation, namely herbivory by Collembola, Millipedes, larval stages of other insect orders and possibly also mites and invertebrates with sucking mouth parts as evidenced by the manifestly 'moth eaten' appearance of many plants in the field when compared with the very healthy appearance of plants in cultivation. These observations provide circumstantial evidence that invertebrate predation may be a major source of natural mortality. The taxon may also be threatened by illegal collection.

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 Vulnerable

The Extent of Occurrence across the taxon's range is estimated to be 6,864 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 naturally at the regional and landscape scales. Despite spore having the capacity to be dispersed by wind over large distances, the extreme isolation of Victorian occurrences from each other and from the closest interstate occurrences render recolonisation highly unlikely in the event of local extinction. The highly disjunct occurrence on the Ballantyne Hills in East Gippsland, for example, is 250 km from the closest known occurrence in New South Wales.

It is estimated to have 2 locations. It has a continuing decline in (i), (ii), (iii), (iv) and (v) above, based on the current and projected impact of the identified threats.

Eligible under Criterion B2 as Endangered

The Area of Occupancy (AoO) across the taxon's range is estimated to be 24 km², based on 2 x 2 km grids derived from accepted, post-1970 records in the VB. As above, it is severely fragmented, has 2 locations and 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:

Ineligible under Criterion C as Data Deficient

There are no indications of subpopulation size accompanying any of the records of the taxon in Victoria. Consequently, there is no available estimate of current population size.

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.

Parkinson, B.M. (1987). Tapetal organization during sporogenesis in *Psilotum nudum*. Annals of Botany 60: 353-360.

VicFlora (2020). Flora of Victoria, Royal Botanic Gardens Victoria: *Psilotum nudum*. Retrieved from: https://vicflora.rbg.vic.gov.au/flora/taxon/32bef67f-658b-4aa7-b961-820975829c56