Threatened Species Assessment

Carex echinata
Star Sedge

Taxonomy

Carex echinata Murray

Current conservation status

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

Proposed conservation status

Endangered in Victoria

Criteria B1ab(i,ii,iii,iv,v)+2ab(i,ii,iii,iv,v)

Species Information

Description and Life History

The taxon is a perennial herb with a very short rhizome; shoots densely tufted. Culms erect, trigonous to subterete, smooth or scarcely scaberulous just below the inflorescence, 4-30(-70) cm long, 0.5 mm diam. Leaves shorter than to exceeding culms, 0.5-1.5 mm wide, margins antrorsely scabrous; sheath pale brown; ligule rounded. Inflorescence small, narrow, erect, 1-3 cm long, with 3-5 spikes solitary at nodes; lowest involucral bract very short. Spikes sessile, ± distant, 0.3-0.7 cm long, each spike usually developing only a few utricles; uppermost spike with female flowers above male flowers; lower spikes female; glumes acute to obtuse, pale red-brown with green midrib and broad hyaline margins; female glumes 1.5-2.5 mm long; utricles 2.5-3.5 mm long, 1.0-1.5 mm diam., ovoid, ± falcate, with truncate thickened base, faintly nerved, hispid on upper margins, yellow-brown, spreading or strongly reflexed at maturity; beak prominent, c. 1 mm long, with apex bifid or notched; style 2-fid. Nut ovoid to broad-ellipsoid, lenticular, yellow-brown. The taxon flowers in summer (VicFlora 2015). Mature inflorescences with widely spreading utricles, forming star-shaped clusters, make this species easy to recognise (VicFlora 2015).

Generation Length

The generation length of *Carex echinata* is estimated to be 25 to 50 years. This is based on a plausible longevity exceeding 50 years and the inference that vegetative resprouting is likely to be as important as seed-based recruitment for population maintenance under pre-settlement conditions. The pre-settlement fire interval was probably in the 50-100 year range, with fire affecting only a mosaic proportion of plants at any one site. Seed-based recruitment is likely to be opportunistic in response to localised site disturbance events and seasonal conditions.

Distribution

The taxon is confined to the higher alps (Bogong High Plains, Buckety Plain and Cobberas areas) where it is rather uncommon. However there are no site or specimen records to support the VicFlora (2015) claim that the taxon occurs in the Cobberas. It also occurs in New South Wales, and is native to New Guinea, New Zealand, Eurasia and North America (VicFlora 2015).

Habitat

The taxon is found in Victoria in the higher alps, occurring in wet valley-floor bogs and heaths (VicFlora 2015). Site and specimen data indicate the taxon is consistently associated with *Carex gaudichaudiana* (Fen Sedge) and

frequently also with *Sphagnum cristatum* (Peat Moss). *Empodisma minus* (Spreading Rope-rush) often dominates the habitat.

Threats

Alpine grazing of cattle on the Bogong High Plain has been a major historic threat resulting in widespread destruction of wetland habitats and facilitating exotic weed invasion. The taxon has demonstrated some resilience in the face of cattle grazing, sometimes colonising disturbed and degraded sites, apparently acting as a cyclic successional species. At other sites, the taxon has been observed to be heavily trampled and severely pugged by cattle. The consistent association with *Carex gaudichaudiana* (Fen Sedge), which is targeted by cattle, and often with *Sphagnum cristatum* (Peat Moss), which is highly susceptible to trampling and pugging, emphasise the vulnerability of the habitat of the taxon to cattle grazing.

Although the direct impact of cattle grazing ceased with the cancellation of grazing licences throughout the Alpine National Park, with a likely recovery of the population and its habitat, the legacy of weed invasion persists. The taxon continues to be threatened by weed invasion, for example at Basalt Hill and Langford Gap, Dinner Plain (where State Forest is still grazed) and Buckety Plain

The key current and future threat to the taxon is the long-term impact of climatic drying, coupled with increasing temperatures, leading to shrub invasion of subalpine to alpine wet heath or bog communities. Such invasion is exacerbated by imposed anthropogenic and climate-induced increases in fire frequency, intensity and landscape scale.

The taxon may now be threatened also by Sambar Deer which, in recent years, have been observed within the habitat of the taxon across the Bogong High Plains where their pugging and wallowing behaviour is highly destructive.

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 A3 as Vulnerable

The population reduction over the next 75 to 100 years is projected to be 30 to 40%, based on (c) and (e) above.

Future decline is based on the projected impact of climate change on the wetland and wet heath habitat of the taxon.

Eligible under Criterion A4 as Vulnerable

The population reduction over any 75 to 150 year period, including both past and future (up to 100 years in the future), is estimated to be 20 to 45% (midpoint 30%), based on (c) and (e) above.

Past decline cannot be estimated since the extent of recovery following the cancellation of alpine grazing licences is not recorded and the early impact of climate change is also not recorded. Future decline is based on the projected impact of climate change on the wetland and wet heath habitat of the taxon.

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 460 km², based on accepted, post-1970 records from the Victorian Biodiversity Atlas (VBA).

The taxon is estimated to be severely fragmented naturally at the landscape scale with all geographically isolated stands occurring at separations likely to greatly exceed the dispersal range of the taxon, which has no specialised mechanism for long-distance dispersal. Seed-bearing utricles are likely to be dispersed downstream by water within each catchment unit.

It is estimated to have 1 location. 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 80 km², based on 2 x 2 km grids derived from accepted, post-1970 records in the VBA. As above, it is estimated to be severely fragmented, to have 1 location 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

It is estimated that there are 10,000 to 100,000 mature individuals, which exceeds the thresholds for criterion C.

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.

VicFlora (2015). Flora of Victoria, Royal Botanic Gardens: *Carex echinata*. Retrieved from: https://vicflora.rbg.vic.gov.au/flora/taxon/cf6adcbc-dfd2-4f1e-bb9f-7df60ce3e1ae