Threatened Species Assessment

Carex cephalotes
Wire-head Sedge

Taxonomy

Carex cephalotes F. Muell.

This taxon is very close to *C. pyrenaica* Wahl. of Europe, of which it was once treated as a variety. *C. pyrenaica* has predominantly 3-fid styles and distinctly stipitate utricles. The unispicate inflorescence distinguishes this species from all other Victorian species except *C. capillacea* and *C. archeri*. It differs from *C. capillacea* in having the male part of the spike shorter than the female part, and from *C. archeri* it differs in the lowest involucral bract being glume-like (VicFlora 2015).

Current conservation status

Listed as threatened under the *Flora and Fauna Guarantee Act 1988* (SAC 1991).

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

Proposed conservation status

Critically Endangered in Victoria

Criteria A3ce+4ce; 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 short rhizome; shoots densely tufted. Culms erect, terete, smooth, 5-20(-30) cm long, 0.5-1.2 mm diam. Leaves usually shorter than culms, 0.5-1.2 mm wide, margins antrorsely scaberulous; sheath yellow-brown; ligule rounded to truncate. Inflorescence erect, 0.5-1.5 cm long, with 1 spike; lowest involucral bract shorter than inflorescence. Spike with very short portion of male flowers above female flowers; male glumes obtuse, ± hooded, yellow-brown; female glumes obtuse to acute, yellow-brown tinged darker brown, with hyaline margins, 2.5-3 mm long; utricles 2.5-4 mm long, 1.0-1.4 mm diam., ellipsoid to ovoid, nerveless or irregularly few-nerved, glabrous, greenish-brown, orange-brown near apex, spreading or reflexed at maturity, and then female portion of spike cylindrical and ; beak c. 0.5 mm long, with apex split, white; style 2-fid, rarely 3-fid (occasionally a single spike can have one or two flowers that are 3-fid). Nut ellipsoid to ovoid, lenticular or rarely trigonous, pale yellow-brown. The taxon flowers in summer (VicFlora 2015).

Generation Length

The generation length of *Carex cephalotes* is estimated to be 25 to 50 years. This It 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 very rare in Victoria where confined to the highest mountains in the Alpine region (e.g. Mts Bogong, Feathertop, Hotham, Nelse). Also New South Wales, New Zealand (VicFlora 2015).

Beauglehole and Chesterfield list records in the Victorian Biodiversity Atlas (VBA) for the Snowy Range are not supported by reliably determined specimen records in the Australian Virtual Herbarium (AVH) and are likely to result from confusion with the similar *C. archeri* or *C. capillacea*. Similarly, there are no specimen records in the AVH to support a number of site records in the VBA for the Mt Loch and Mt Hotham areas, nor are there any site or specimen records to support the reference in VicFlora (2015) to the taxon occurring at Mt Feathertop. All these records are likely to be based on misidentification of *C. archeri*. The taxon is therefore reliably recorded in Victoria at only two mountain summits - Mounts Bogong and Nelse. The taxon has not been confirmed on Mt Bogong since 1980 and may already be locally extinct at this site.

Habitat

The taxon is confined in Victoria to sheltered rocky areas on the highest mountains near where snow persists late into the season (VicFlora 2015). It is a habitat specialist, apparently confined to late-lying snowpatch areas on the summits of the highest mountains where reliably recorded only in the vicinity of Mt Nelse and Mt Bogong at elevations of 1820-1880 m.

Collectors' notes record the habitat at these two sites as snowpatch vegetation, treeless herbfield near summit, edge of basalt/quartz erosion pavement, steeply south-east falling pavement of small, embedded rock, areas of late-lying snow receiving constant run-off, *Celmisia sericophylla* herbfield, rocky sandy loam on edge of mountain and in a drainage line with permanent flowing water.

At Mt Nelse the taxon occurs in *Plantago glacialis-Oreomyrrhis pulvinifica* herbland along drainage lines and in the drier *Poa costiniana* grassland in the inter-drainage line sections. It is typically associated with *Carex hypandra* (Alpine Fen-sedge), *Celmisia sericophylla* (Silky Snow-daisy), *Luzula acutifolia* subsp. *acutifolia* (Sharp-leaf Woodrush), *Montia australasica* (White Purslane), *Oreomyrrhis pulvinifica* (Cushion Caraway), *Plantago glacialis* (Small Star-plantain), *Poa costiniana* (Bog Snow-grass) and *Psychrophila introloba* (Alpine Marsh-marigold).

Threats

The taxon is unlikely to survive the loss of its snow-melt habitat in the next 100 years, noting that climatic drying and warming are already causing a demonstrable decline in the persistence of snow with observable contraction in the extent of snowpatch vegetation between, for example, Mt Nelse North and Spion Kopje.

Alpine grazing of cattle on the Bogong High Plain has been a major historic threat, resulting in widespread invasion of many habitats by both native and exotic species. The key impact of cattle grazing on the taxon was considered at the time to be the selective eating of inflorescences in all stages of development, severely reducing the reproductive capacity of the population. In 1998 severe erosion and site damage from past grazing was recorded at the site of the Nelse Saddle stand. 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, the legacy of weed invasion persists. Competition with exotic weeds is not, however, the primary cause of the projected local extinction of the taxon.

The taxon may also be threatened by Sambar Deer which, in recent years, have been observed within the habitat of the taxon at Mt Nelse. Sambar have been observed to browse *Psychrophila introloba* (Alpine Marsh-marigold), which dominates one of the microhabitats in which *Carex cephalotes* has been recorded, and their pugging and wallowing behaviour in such habitats 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 Critically Endangered

The population reduction over the next 75 to 100 years is projected to be 80 to 100%, based on (c) and (e) above.

This is based on the projected impact of climate change on the snowpatch habitat of the taxon.

Eligible under Criterion A4 as Critically Endangered

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 50 to 100% (midpoint 80%), based on (c) and (e) above. The causes of reduction may not have ceased, be understood or be reversible.

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.

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 Critically Endangered

The Extent of Occurrence (EoO) across the taxon's range is estimated to be 19 km², based on accepted, post-1970 records from the VBA. The lower bound estimate excludes Mt Bogong records which have not been confirmed since 1980.

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 one 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.

The taxon is severely fragmented

Eligible under Criterion B2 as Critically Endangered

The Area of Occupancy (AoO) across the taxon's range is estimated to be 12 km², based on 2 x 2 km grids derived from accepted, post-1970 records in the VBA. As above, it is severely fragmented, has 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:

Eligible under Criterion C1 as Endangered

It is estimated that there are 1,000 to 5,000 mature individuals. In 1981, population size of the Mt Nelse stand was estimated to be 1000 individuals. By 1998 the population of this stand was estimated to be 90, possibly due to drought conditions. In 1998 the stand at Nelse Saddle was estimated to comprise 1000 individuals. The size of the Mt Nelse North stand was not recorded.

There is estimated to be a continuing decline of 50 to 100% (midpoint 80%) within two generations.

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 1,000 to 5,000 individuals, and 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.

SAC (1991). Flora and Fauna Guarantee Scientific Advisory Committee: Final Recommendation on a Nomination for Listing. Nomination No. 156 *Carex cephalotes*.

VicFlora (2015). Flora of Victoria, Royal Botanic Gardens: *Carex cephalotes*. Retrieved from: https://vicflora.rbg.vic.gov.au/flora/taxon/0c2d5ab5-6ad5-440e-9bed-00707f3c6218