Threatened Species Assessment

Trianthema triquetrum
Red Spinach

Taxonomy

Trianthema triquetrum Willd

T. triquetrum is an unresolved species complex, currently under investigation. Victorian plants were previously thought to be *T. clavatum,* however, a conservative approach is adopted here, and the name *T. triquetrum* is used in a broader sense pending resolution of the complex (VicFlora 2020).

Current conservation status

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

Proposed conservation status

Critically Endangered in Victoria

Criteria B1ac(iv)+2ac(iv)

Species Information

Description and Life History

The taxon is a prostrate or diffuse, annual herb; branches to 60 cm long, papillose. Leaves terete to clavate, 6-8 mm long, 2-4 mm wide; glabrous, mid to dull green, apex obtuse; petiole 2-4 mm long, expanded into a toothed sheath. Flowers sessile, in dense clusters of 3-6, each flower subtended by 3 acuminate bracts; perianth tube 1-2 mm long, lobes ovate-triangular, c. 1 mm long, papillose near apex, white to pink; stamens 5. Operculum 1-1.5 mm diam., thick-walled, rounded with an impressed membranous cover; seeds 2, disc-shaped, black, 1-1.5 mm long (VicFlora 2020).

Generation Length

The generation length of *Trianthema triquetrum* is inferred to be 2 to 7 years. This is based on a mean frequency of La Niña events and the inference that the taxon recruits episodically in response to good seasonal rain events. The taxon is a short-lived annual.

Distribution

The taxon is apparently restricted to the Murray River floodplain north west of Mildura (VicFlora 2020). It is known from a single occurrence at Yelta near Mildura, on the Calder Hwy road reserve, on the north side, Meridian Road, Yelta. Approximately 100 plants were observed growing in a depression at the side of the road. The plants emerged after a 55 mm rain event in early January 2015 (Ian Sluiter pers. comm. 20/2/15).

It should be noted that there is circumstantial evidence to suggest that the taxon may be adventive to Victoria and other geographically outlying sites in New South Wales and South Australia to which the taxon may have been dispersed by stock to disjunct locations. The taxon is strongly suspected to be adventive to the site, since it is in a highly modified in a sloping landscape, that is likely to have supported *Callitris gracilis* on higher ground and is now supporting *Dodonaea viscosa* susp. *angustissima, Acacia victoriae* and *Acacia oswaldii.*

Whilst a historic record from 1856-6 supports the inference that the taxon is indigenous at Yelta, both records are highly disjunct in districts settled since the 1850s. The only other interstate records in the Australian Virtual Herbarium (AVH) close to Victoria is a record from 1972 in Deniliquin. Records that are at the edge of the

continuous interstate range strongly suggest that the taxon is adventive at both the Yalta/Wentworth and Deniliquin districts (Ian Sluiter pers. comm. 9/7/18).

Habitat

The taxon is apparently restricted to the Murray River floodplain on light clay (VicFlora 2020). However, a site was noted 200 metres from Abbotsford Bridge on the Murray on the upstream side on elevated red soil, and not on the floodplain where soils are grey (Ian Sluiter pers. comm. 9/7/18).

The taxon has been known to occur in chenopod shrubland, on a Woorinen Formation of light, reddish-brown clay. Associated taxa included *Chenopodium nitrariaceum, Eragrostis australasica, Enteropogon acicularis* and *Atriplex lindleyi* subsp. *inflata* (Ian Sluiter pers. comm. 20/2/15). Also present are *Maireana appressa* and *M. brevifolia* (Ian Sluiter pers. comm. 9/7/18).

The taxon is situated mostly on flats or in depression within open woodlands. It occurs less commonly in bladder saltbush or bluebush communities, and on numerous soil types. It is quite hardy, and may be common following good spring rains, but usually dies off in late summer or autumn (Cunningham *et al.* 1992).

Threats

The taxon is not readily grazed by stock, although it is eaten at times in the absence of more palatable plants (Cunningham *et al.* 1992).

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 Critically Endangered

The Extent of Occurrence (EoO) across the taxon's range is estimated to be 4 km², based on accepted, post-1970 records from the Victorian Biodiversity Atlas (VBA). The EoO has been made equal to the AoO to ensure consistency with the definition of AoO as an area within EoO.

A single location is based on a single occurrence at Yelta near Mildura, adjacent to the Calder Highway.

It has extreme fluctuations in (iv) above as it is an annual forb, and may be common following good spring rains, usually dying off in late summer or autumn.

Eligible under Criterion B2 as Critically Endangered

The Area of Occupancy (AoO) across the taxon's range is estimated to be 4 km², based on 2 x 2 km grids derived from accepted, post-1970 records in the VBA. As above, the taxon has one location and has extreme fluctuations in (iv) 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 100 to 200 mature individuals, but other thresholds under this criterion have not been met.

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 Endangered

It is estimated that there are 100 to 200 mature individuals. The only estimates of the population size for the Victorian occurrence are 200 plants in 2007 and 100 plants in 2015.

Criterion E (Quantitative Analysis) was not addressed as the taxon does not have a detailed Population Viability Analysis.

References

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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

Hartmann, H.E.K., Meve, U., and Liede-Schumann, S. (2011). Towards a revision of *Trianthema*, the Cinderella of Aizoaceae. *Plant Ecology and Evolution, 144*(2), 177-213.

VicFlora (2020). Flora of Victoria, Royal Botanic Gardens Victoria: *Trianthema triquetrum.* Retrieved from: https://vicflora.rbg.vic.gov.au/flora/taxon/5bef11a8-cc9d-467b-9c8c-d1c98d0d1bcc