



Nymphoides crenata Wavy Marshwort

Taxonomy

Nymphoides crenata (F. Muell.) Kuntze

Current conservation status

Listed as threatened under the *Flora and Fauna Guarantee Act 1988* (SAC 2006).

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

Proposed conservation status

Endangered in Victoria

Criteria A2ce; B2ab(i,ii,iii,iv,v)c(iv)

Species Information

Description and Life History

The taxon is a perennial forb; stems to 3 m long, floating, stoloniferous. Petioles of basal leaves 8-42 cm long; blades broad-ovate to c. circular, crenate to crenate-dentate, deeply cordate, 3-13(-15) cm long; blades of stem leaves smaller, sometimes reniform to c. deltoid. Flowers heterostylous, 8-14 in a cluster subtended by 1-4 stem leaves or rarely in spaced pairs along a short inflorescence; calyx 5.5-10(-16) mm long; corolla 20-40(-50) mm diam., lobes (4-)5(-6), with broad lacinate wings and keel; stigmas mostly (2-)5, each with a vertical papillate wing decurrent on the style, the decurrent portions forming persistent stylar ridges. Capsule (4-)6-9 mm long, usually much shorter than calyx; seeds ellipsoid, strongly laterally compressed, (0.5-)0.6-0.9 mm long, pale brown, usually smooth, sometimes granular around edges; caruncle absent; minute hard projection present beside attachment point. Flowers mostly September-May, fruits November-March (VicFlora 2018).

Generation Length

The generation length of *Nymphoides crenata* is estimated to be 25 to 50 years. However, this cannot be estimated with confidence since it is unclear whether the taxon recruits vegetatively from surviving rhizomes, or by seed recruitment following flood events which, at the time of European settlement, are likely to have occurred at intervals of 15-25 years or more.

Distribution

The taxon is rare in all regions except the Riverland, and is perhaps now extinct at Wilsons Promontory, on the Otway Plain, and in the Wimmera, from where there have been no contemporary collections. Aston (1973), however, questions the reliability of some southern Victorian records.

The taxon is also found in WA, NT, SA, Qld, and NSW (VicFlora 2018).

Habitat

The taxon occurs in fresh, still to slow flowing water to 1.5 m deep in swamps, lagoons, irrigation channels, and streams. It is also frequent in temporarily inundated depressions (VicFlora 2018).

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Threats

The taxon has declined substantially across the state through a combination of the drainage of wetlands, years of below average rainfall, and particularly by the impact of European Carp (*Cyprinus carpio*) and grazing by cattle. The habitat of this taxon has been almost comprehensively destroyed or altered, and is exposed to many threatening processes including increasing salinity, weed invasion, and changed hydrological regimes. It is now confined to certain localities on and near the Murray River, hence why it may also be adversely affected by river regulation (SAC 2006). The taxon has also been targeted by the horticultural trade for pond plants, for example in 2006 when the public could purchase the taxon at a nursery in Melbourne.

Most of these threats persists, and may increase in intensity, in response to climate change and river regulation, although the latter may be mitigated by environmental water allocation.

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%

<p>A1 Population reduction observed, estimated, inferred or suspected in the past and the causes of the reduction are clearly reversible AND understood AND ceased.</p> <p>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.</p> <p>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]</p> <p>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.</p>	<p>based on any of the following:</p>	<p>(a) direct observation [except A3]</p> <p>(b) an index of abundance appropriate to the taxon</p> <p>(c) a decline in area of occupancy, extent of occurrence and/or quality of habitat</p> <p>(d) actual or potential levels of exploitation</p> <p>(e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites</p>
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Evidence:

Eligible under Criterion A2 as Endangered

The population reduction over the past 75 to 150 years is estimated to be 50 to 90% (midpoint 60%), based on (c) and (e) above.

Past decline is based on the historic impact of the identified threats, notably the drainage of wetlands, years of below average rainfall, the impact of European Carp, and grazing by cattle.

The causes of the reduction may not have ceased, be understood or be reversible.

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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 km ²	< 5,000 km ²	< 20,000 km ²
B2. Area of occupancy (AOO)	< 10 km ²	< 500 km ²	< 2,000 km ²
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 Endangered

The Area of Occupancy (AoO) across the taxon's range is estimated to be 138 to 146 km², based on 2 x 2 km grids derived from accepted, post-1970 records in the Victorian Biodiversity Atlas.

The taxon is estimated to be severely fragmented naturally at the regional and landscape scales, and anthropogenically at the landscape scale. All occurrences are in discrete waterbodies situated at separations exceeding the low inferred dispersal range of the taxon, therefore the probability of recolonisation in the event of local extinction is remote.

It is estimated to have 2 to 3 locations, and has a continuing decline in (i), (ii), (iii), (iv) and (v) based on the current and projected impact of the identified threats.

It is estimated to have extreme fluctuations in (iv) above, in population size between successive cohorts.

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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 is insufficient evidence to determine the number of mature individuals.

Criterion D. Very small or restricted populations				
		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 km ² 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

Aston, H.I. (1973). *Aquatic plants of Australia: a guide to the identification of the aquatic ferns and flowering plants of Australia, both native and naturalized*. Melbourne University Press

DEPI (2014) *Advisory list of rare or threatened plants in Victoria - 2014*. Department of Environment and Primary Industries, Melbourne.



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SAC (2006). Flora and Fauna Guarantee Scientific Advisory Committee: Final Recommendation on a Nomination for Listing. Nomination No. 743 *Nymphoides crenata*

VicFlora (2018) Flora of Victoria, Royal Botanic Gardens Victoria: *Nymphoides crenata*. Retrieved from: <https://vicflora.rbg.vic.gov.au/flora/taxon/677ce757-4c15-44a7-aafc-5034afb2a287>