Threatened Species Assessment

Bossiaea vombata
Wombat Bossiaea

Taxonomy

Bossiaea vombata J.H. Ross

Records of *Bossiaea vombata* from East Gippsland are dated 1854, 1941, 1953, and 1957. Specimens from eastern Victoria cannot be identified with certainty as they are sterile. Given the uncertain determination of sterile collections and the biogeographic and ecological likelihood that these eastern populations are far more likely to represent another local endemic consistent with the recent segregation of *B. bombayensis* and *B. grayi* (both local endemics in the region segregated from *B. bracteosa*), it is strongly suggested these eastern records cannot be reliably ascribed to *B. vombata* and not tenably as extant.

Thompson (2012) commented that "*B. grayi* is very similar to *B. vombata.* The record given for Victoria is tentatively identified as *B. grayi* based on vegetative features as it lacks flowers and fruits". This tentative record of *B. gray*i is "Limestone Track, c. 1.2 km from the Benambra-Wulgulmerang Rd. J.A. Jeanes 2336, 03.ii.2010 (CANB, MEL)" which is upstream of the eastern tentative records of *B. vombata* and also within the catchment of the Snowy River.

Furthermore, 61 years has elapsed since the most recent collection at WTree (L. Hodge November 1957 MEL). Since the region has been well surveyed by numerous botanists (including Beauglehole, Walsh, Gullan, Forbes, Cameron, Turner, Eichler and others), the lapse of more than 50 years without further records is considered grounds for a presumption of location extinction.

Current conservation status

Listed as threatened under the *Flora and Fauna Guarantee Act 1988* (SAC 2017).

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

Proposed conservation status

Critically Endangered in Australia

Criteria A3ce; B1ab(i,ii,iii,iv,v)+2ab(i,ii,iii,iv,v); C2a(i); D

Species Information

Description and Life History

The taxon is an erect rhizomatous shrub to 1.2 m high, more or less glabrous, new growth often sparsely hairy; branches flattened and winged, ultimate branches of cladodes 2-10 mm wide, recess at nodes absent or very shallow, greyish green (green when young). Leaves reduced to scales 2-4 mm long, up to 1 mm wide from midrib to margin, venation obscure. Flowers usually solitary, 7-10 mm long; pedicels c. 2 mm long; bracts several, conspicuous, reddish-brown, distichous, 2-3 mm long, persistent; bracteoles inserted near base, caducous; calyx 4-5 mm long, glabrous; standard ± equal in length to other petals, deep yellow, sometimes suffused with red on inner surface; ovary shortly stipitate, glabrous, 4-6-ovuled. Mature pods not known to be produced. All known occurrences are clonal and sterile. The taxon flowers in October (VicFlora 2018).

The taxon is the only leafless *Bossiaea* species in Victoria with uniformly yellow or yellowish-white petals, and it differs also in being rhizomatous and infertile. *Bossiaea vombata* is most closely allied to *B. bracteosa.*

While each colony is producing clonally, the lack of young individuals away from the colonies indicates a lack of recruitment. No germination event has been recorded for the taxon. The plants appear to spread by underground rhizomes and there are few visibly distinct cohorts, indicating that germination is rare and that populations are clonal. Observations by Ross (2008) indicate that the pollen may not fully form leading to poor development of fruit. In January 2010, of the nine fruit/pods observed by M. Ralph (Wombat Forestcare) on the Spargo-Blakeville Rd population, three fruit eventually developed with one seed each (Lisa Macaulay pers. comm). There is little or no opportunity for gene flow between sites as they are separated by at least 3 km, leading to the risk that isolated populations could be suffering from inbreeding depression (SAC 2017).

Generation Length

The generation length of *Bossiaea vombata* is suspected to be 50 to 200 (midpoint 100) years. The longevity of the clones or genets is indefinite. The generation time depends on whether seed production is triggered by unknown cues at an unknown frequency and then sequestered into a soil stored seed bank and induced to recruit in the event of mortality of the parent clone.

Distribution

The taxon is endemic to Victoria and is restricted to the Wombat State Forest near Daylesford, in south-central Victoria, where only two subpopulations are reliably known and each appears to be vegetatively (i.e. clonally) reproducing. The subpopulations are within a few metres of a roadside or close to the road verge. The opportunities for dispersal and population growth are limited (SAC 2017). There are also historic records based on herbarium sheets that appear to be the same entity, from the Snowy River gorge and Bendoc areas in East Gippsland (VicFlora 2018).

Habitat

The taxon occurs in open dry *Eucalyptus radiata* and/or *E. rubida* forest, with an understorey of *Acacia melanoxylon* on reddish-brown clay-loam, with *Joycea pallida, Gahnia radula* and *Daviesia ulicifolia*. A Snowy River specimen notes 'sandy-rocky banks of the river' (SAC 2017; VicFlora 2018).

Threats

In its final recommendation, the Flora and Fauna Guarantee Scientific Advisory Committee (SAC 2017) noted:

Due to the location adjacent to roadsides and the small numbers of subpopulations and the restricted area, most of the threats affecting the taxon could result in its extinction. In particular, potential roadside management (e.g. draining works, road works, fire break construction or mowing for fuel reduction), wildfire, and the impacts due to grazing pressure by native herbivores, such as wombats and kangaroos.

Additional threats include increased fire frequency from fuel reduction burning as well as from climatic warming and drying. There is also a risk of exposure of vegetative resprouting stands to intense and targeted browsing by wallabies, Sambar or other deer species.

The known subpopulations are in State forest and should be readily protected from disturbance; however, undetected clones in the Wombat Forest may be at some risk from forestry operations, road maintenance and fire management.

The apparent inability of this taxon to produce seed poses a further risk to its long-term survival.

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 100 years is projected to be 80 to 100%, based on (c) and (e) above.

The historic decline since settlement is unknown, but the current and identifiable future threats suggest a future decline that may be significant in the next 100 years. The inability to relocate the Beauglehole 1982 record after only 26 years despite intensive targeted searching, indicates that there may have been local extinction, even within a Reference Area where roading and forestry were excluded. Therefore, future decline could easily exceed 80%.

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 8 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 the EoO.

The taxon is estimated to be severely fragmented, with no known mechanism for recolonisation in the event of local extinction, since it is sterile and lacking any seed bank or dispersal mechanism.

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, including the effects of potential roadside management (i.e. road widening activities), increased fire frequency, climatic warming and drying and browsing by wallabies, Sambar or other deer species.

Eligible under Criterion B2 as Critically Endangered

The Area of Occupancy (AoO) across the taxon's range is estimated to be 8 km², based on 2 x 2 km grids derived from accepted, post-1970 records in the VBA. As above, the taxon is estimated to be severely fragmented, has one 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 C2 as Critically Endangered

It is estimated that there are two genetically distinct mature individuals. It has been speculated that that the type population on Farm Road and the Spargo-Blakeville Road population each represent a single clonal genet. This is despite an initial estimate of a population of about 50 plants at the type location. As each genet is very restricted in area, each is considered a single individual.

The number of mature individuals is inferred to continue to decline, and the number of mature individuals in each subpopulation is 50 or fewer.

Continuing decline is based on the current and projected impact of the identified threats, which may have already led to the loss of the Beauglehole 1982 record.

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 Critically Endangered

The taxon is estimated to have 2 mature individuals.

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.

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SAC (2017). Flora and Fauna Guarantee Scientific Advisory Committee: Final Recommendation on a Nomination for Listing. Nomination No. 878 *Bossiaea vombata.*

Thompson, I. R. (2012). A revision of eastern Australian *Bossiaea* (Fabaceae: Bossiaeeae) from Victoria. *Muelleria, 30*(2), 106-174.

VicFlora (2018). Flora of Victoria, Royal Botanic Gardens Victoria: *Bossiaea vombata.* Retrieved from: https://vicflora.rbg.vic.gov.au/flora/taxon/83244971-bcdb-4135-a15a-3cd4657d5eef