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Notice and reasons for the Final Determination

The NSW Threatened Species Scientific Committee, established under the *Biodiversity Conservation Act 2016* (the Act), has made a Final Determination to list the shrub *Asterolasia beckersii* Orme & Duretto as a CRITICALLY ENDANGERED SPECIES in Part 1 of Schedule 1 of the Act and as a consequence, to omit reference to *Asterolasia beckersii* Orme & Duretto from Part 2 of Schedule 1 (Endangered species) of the Act. Listing of Critically Endangered species is provided for by Part 4 of the Act.

The NSW Threatened Species Scientific Committee is satisfied that *Asterolasia beckersii* Orme & Duretto has been duly assessed by the Commonwealth Threatened Species Scientific Committee under the Common Assessment Method (Commonwealth TSSC 2021, based on Le Breton 2020). The acceptance of this assessment is provided for by Part 4.14 of the Act.

Summary of Conservation Assessment

Asterolasia beckersii was found to be Critically Endangered in accordance with the following provisions in the *Biodiversity Conservation Regulation 2017:* clause 4.4(a),(e)(i)(ii)(B). The main reasons for the species being eligible are: i) the species has a very low number of mature individuals; ii) there is a continuing decline in the number of mature individuals due to a range of threats; and iii) all or nearly all mature individuals of the species occur within one population.

The Scientific Committee has found that:

1. *Asterolasia beckersii* Orme & Duretto (family Rutaceae) was formerly known as *Asterolasia* sp. 'Dungowan Creek' Beckers, and was described by Orme and Duretto (2017) as an "Erect shrub to 3 m tall. Stems with a dense stellate indumentum, stellae rusty to orange-brown in colour. Leaves mostly shortly petiolate; petiole (0.5–)1.5–5.5(–9.5) mm long; lamina oblanceolate to obovate or elliptic, (6–)15–45(–55) mm long, (4–)6–16(–22) mm wide, apex obtuse or rounded, base cuneate to obtuse, margins entire, undulate; abaxial surface with densely overlapping hyaline stellate hairs, stellae 0.35–0.75 mm diameter, with larger rusty coloured rays; adaxial surface with a short indumentum of hyaline stellate hairs, stellae 13–25 per mm2, 0.2–0.3 mm diameter. Inflorescence a terminal (occasionally axillary) umbel of 1–3 flowers, usually with one or two flowers opening at one time, occasionally with 3 flowers open at once; pedicel 5–8(–10) mm long in flower, lengthening slightly as fruit develops. Calyx inconspicuous. Petals 6–7 mm long, cream to white; abaxial surface with hyaline stellate hairs, rays free; adaxial surface glabrous. Stamens: filaments glabrous; anthers 1.2–2.0 mm long. Carpels 5; ovary densely hairy with coarse stellate hairs; style glabrous. Cocci with stellate hairs in 2 layers, a lower obscured layer of smaller hairs with an upper layer of larger rusty coloured hairs; cocci beaked to 2.5–3.5 mm long. Seed 2.0–2.5 mm long, dark grey-brown, glabrous, reniform."

2. *Asterolasia beckersii* is endemic to NSW and is currently known from only one extant population, southeast of Tamworth (Eco Logical Australia 2021). Two additional populations were previously known from the same general area (one with around 20 individual plants in 2006 (Copeland 2006) and the other with around 20 plants in 2019 (Eco Logical Australia 2021)). For these two populations, however, recent surveys found no evidence of any plants above ground and if the species persists there, it is only within the soil seed bank (Eco Logical Australia 2017, 2021).

3. *Asterolasia beckersii* has a very highly restricted geographic distribution. The extent of occurrence (EOO) for *A. beckersii* is estimated to be 26 km^2, based on a convex hull polygon around all records of the species from the most recent surveys, as per IUCN (2019). The area of occupancy (AOO) is estimated to be 20 km^2, based on 2 x 2 km grid cells, as per IUCN (2019). Including the sites where no above ground plants can be detected (where the species may persist in the soil seed bank) gives an upper bound for EOO and AOO of 90 km^2 and 24 km^2, respectively.

4. Surveys in 2017 located 196 mature individuals of *Asterolasia beckersii*, with most of these individuals (185) concentrated in one population (Eco Logical Australia 2017). Located individuals occurred almost entirely on unreserved tenure with only two mature individuals known from within Tuggolo Creek Nature Reserve. Surveys in 2021, after some sites had been burnt in the 2019/2020 wildfires (Eco Logical Australia 2021) found no plants post-fire in July 2020 or April 2021 at one population, no plants post-fire in April 2021 at a second population, and 154 plants (some 113 of which may be possibly mature) at the third population (this population was not burnt in the 2019/2020 fires).

5. There are a number of ongoing threats to *Asterolasia beckersii*, ranging from disturbance by feral pigs, deer and native macropods, habitat disturbance by logging activities in state forests, competition from weeds, and adverse fire regimes. These threats combined with the apparent loss of the two out of three populations constitute a continuing decline for the species. Disturbance by feral pigs (*Sus scrofa*) remains a threat and has been observed at the remaining extant population (Eco Logical Australia 2017, 2021), while browsing impacts by feral deer on plants has also been observed (Eco Logical Australia 2021). Some plants suffered extensive browsing damage, while the majority of plants in the western-most patch of one population had at least some of their growing tips browsed (Eco Logical Australia 2017) and ongoing browsing of shrubs was observed in 2021 (Eco Logical Australia 2021). Logging in Tuggolo State Forest is also likely to result in physical damage and clearing of some individuals. Competition from weeds such as Blackberry (*Rubus* spp.) and Madeira Cherry (*Solanum pseudocapsicum*) also poses a threat to the species (Eco Logical Australia 2017). With substantial tracts of potential suitable habitat for the species having been converted to farmland, adverse fire regimes (particularly too infrequent fire) may be a threat for the remaining habitat. There were no recorded fires in the vicinity of any of the extant populations prior to 2019 (OEH Fire History Layers 2017). However, such records may not be complete as not all fires are recorded. The 2019/2020 fires were

estimated to have burnt approximately one to two thirds of known sites (Auld *et al*. 2020; Gallagher 2020), including Back River NR and Dungowan Dam area, and field inspections post-fire confirmed two of the three known sites were burnt (Eco Logical Australia 2021). In 2021, recruitment of new plants has not been observed at any of the populations that were burnt in 2019/2020 fires and when combined with the senescence of mature plants at sites, on-going lack of recruitment represents a long-term threat to the species (Eco Logical Australia 2017, 2021). 'Invasion of native plant communities by exotic perennial grasses', 'Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants', and 'Predation, habitat degradation, competition and disease transmission by Feral Pigs, *Sus scrofa* Linnaeus 1758' are listed as Key Threatening Processes under the Act.

6. *Asterolasia beckersii* Orme & Duretto is eligible to be listed as a Critically Endangered species as, in the opinion of the NSW Threatened Species Scientific Committee, it is facing an extremely high risk of extinction in Australia in the immediate future as determined in accordance with the following criteria as prescribed by the *Biodiversity Conservation Regulation 2017*:

Appendix 1

Assessment against *Biodiversity Conservation Regulation* 2017 criteria
The Clauses used for assessment are listed below for reference.
Overall Assessment Outcome: Critically Endangered under Clause 4.4(a),(e)(i)(ii)(B)

Clause 4.2 – Reduction in population size of species
(Equivalent to IUCN criterion A)
Assessment outcome: Data Deficient

(1) - The species has undergone or is likely to undergo within a time frame appropriate to the life cycle and habitat characteristics of the taxon:			
	(a)	for critically endangered species	a very large reduction in population size, or
	(b)	for endangered species	a large reduction in population size, or
	(c)	for vulnerable species	a moderate reduction in population size.
(2) - The determination of that criteria is to be based on any of the following:			
	(a)	direct observation,	
	(b)	an index of abundance appropriate to the taxon,	
	(c)	a decline in the geographic distribution or habitat quality,	
	(d)	the actual or potential levels of exploitation of the species,	
	(e)	the effects of introduced taxa, hybridisation, pathogens, pollutants, competitors or parasites.	

Clause 4.3 - Restricted geographic distribution of species and other conditions (Equivalent to IUCN criterion B)
Assessment Outcome: Endangered under Clause 4.3(b),(d)(e)(i)(iv).

The geographic distribution of the species is:				
	(a)	for critically endangered species		very highly restricted, or
	(b)	for endangered species		highly restricted, or
	(c)	for vulnerable species		moderately restricted,
and at least 2 of the following 3 conditions apply:				
	(d)	the population or habitat of the species is severely fragmented or nearly all the mature individuals of the species occur within a small number of locations,		
	(e)	there is a projected or continuing decline in any of the following:		
		(i)	an index of abundance appropriate to the taxon,	
		(ii)	the geographic distribution of the species,	
		(iii)	habitat area, extent or quality,	
		(iv)	the number of locations in which the species occurs or of populations of the species,	
	(f)	extreme fluctuations occur in any of the following:		
		(i)	an index of abundance appropriate to the taxon,	
		(ii)	the geographic distribution of the species,	
		(iii)	the number of locations in which the species occur or of populations of the species.	

Clause 4.4 - Low numbers of mature individuals of species and other conditions
(Equivalent to IUCN criterion Clause C)
Assessment Outcome: Critically Endangered under Clause 4.4(a),(e)(i)(ii)(B)

The estimated total number of mature individuals of the species is:				
	(a)	for critically endangered species		very low
	(b)	for endangered species		low, or
	(c)	for vulnerable species		moderately low.
and either of the following 2 conditions apply:				
	(d)	a continuing decline in the number of mature individuals that is (according to an index of abundance appropriate to the species):		
		(i)	for critically endangered species	very large, or
		(ii)	for endangered species	large, or
		(iii)	for vulnerable species	moderate
	(e)	both of the following apply:		
		(i)	a continuing decline in the number of mature individuals (according to an index of abundance appropriate to the species), and	
		(ii)	at least one of the following applies:	

			(A)	the number of individuals in each population of the species is:		
				(i)	for critically endangered species	extremely low, or
				(ii)	for endangered species	very low, or
				(iii)	for vulnerable species	low
			(B)	all or nearly all mature individuals of the species occur within one population,		
			(C)	extreme fluctuations occur in an index of abundance appropriate to the species.		

Clause 4.5 - Low total numbers of mature individuals of species
(Equivalent to IUCN criterion D)
Assessment Outcome: Endangered under Clause 4.5(b).

The total number of mature individuals of the species is:			
	(a)	for critically endangered species	extremely low, or
	(b)	for endangered species	very low, or
	(c)	for vulnerable species	low.

Clause 4.6 - Quantitative analysis of extinction probability
(Equivalent to IUCN criterion E)
Assessment Outcome: Data Deficient

The probability of extinction of the species is estimated to be:			
	(a)	for critically endangered species	extremely high, or
	(b)	for endangered species	very high, or
	(c)	for vulnerable species	high

Clause 4.7 - Very highly restricted geographic distribution of species–vulnerable species
(Equivalent to IUCN criterion D2)
Assessment Outcome: Vulnerable under Clause 4.7.

For vulnerable species,	the geographic distribution of the species or the number of locations of the species is very highly restricted such that the species is prone to the effects of human activities or stochastic events within a very short time period.

Dr Anne Kerle
Chairperson
NSW Threatened Species Scientific Committee

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