

NSW Threatened Species Scientific Committee

Conservation Assessment of *Dracophyllum macranthum* E.A.Br. & N.Streiber (family Ericaceae: Epacridoideae)

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***Dracophyllum macranthum* E.A.Br. & N.Streiber (family Ericaceae: Epacridoideae)**

Distribution: Endemic to NSW

Current EPBC Act Status: not listed

Current NSW BC Act Status: Vulnerable

Proposed listing on NSW BC Act: Delist

Conservation Advice: *Dracophyllum macranthum*

Summary of Conservation Assessment

Dracophyllum macranthum was found to no longer be eligible for listing as a threatened species following the outcomes of targeted surveys conducted since the taxon was initially listed, and from a re-assessment of threats. None of the Listing Criteria are now met.

Description and Taxonomy

Dracophyllum macranthum was described by Brown and Streiber (1999) as a "Shrub 0.6–2(–3) m tall, glabrous, initially erect to spreading but longer branches frequently pendent, open and often sparsely branching from c. 10 cm above base; bark somewhat fibrous, deeply and regularly fissured, grey with reddish tinge towards base of fissures, frequently with dark blotches and lichens; branches distally reddish brown, smooth between leaf scars. Leaves usually not persisting more than 20 cm below apex, erect to spreading, sheathing at base; sheath pale brown, c. 8 mm long and 12 mm wide, gradually narrowed into lamina, margin somewhat membranous; lamina coriaceous, dark to mid green, abaxially slightly paler, linear-triangular, (85–)140–200 mm long, 6–9 mm wide, flat to slightly concave (becoming more so when dried); margin serrulate, up to 8 teeth/cm basally (usually 2 or 3), teeth more numerous distally, antrorse; tip acute and often brownish. Inflorescence (a variously modified superconflorescence, Streiber et al. 1999) terminal, flowers maturing basipetally; primary axis reddish brown; each node with a caducous leaf-like bract, usually with 2 or 3 flowers per node basally and 1, or occasionally 2, flowers per node distally; flowers large for genus, deflexed to spreading, becoming erect after corolla has dropped (probably ± erect in bud), sometimes secund. Bracts brown, triangular, c. 50 mm long, 11 mm wide, with sheath, margin and apex as for leaves (only basal bracts observed). Bracteoles similar to bracts but smaller, c. 8 mm long, 0.5 mm wide. Pedicel reddish brown, 1.5–3 mm long. Calyx rose-coloured (becoming scarious and reddish brown with margin paler in fruit), lobes triangular, (8–)9–10(–11) mm long, 2–2.5 mm wide, c. 1/2 corolla length; margin membranous, ciliolate especially in distal half; apex acute. Corolla dark pink becoming red with age, lobes white; tube cylindrical, (16–)18–22(–25) mm long, 3–3.5(–4) mm diam.; lobes spreading, ovate, 2.5–4 mm long, 1.5–3 mm wide, base obtuse to subcordate, apex obtuse, surface rugose-verrucate. Stamens with filaments inserted at base of corolla tube, 18–20 mm long; anthers attached above midpoint, 2–3 mm long, barely included in corolla throat.

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Pistil slightly longer than corolla tube; nectary scales separate, \pm half height of ovary, upper margin \pm irregularly toothed and truncate; ovary \pm cylindrical, 2–3 mm long, 1–2 mm diam., smooth, locule septum showing as paler vertical line; style filiform, (14–)17–19 mm long, minutely papillose distally; stigma indistinctly 5-lobed. *Fruit* brown, shorter than calyx, style often persisting, seeds not observed.”

Dracophyllum macranthum E.A.Br. & N.Streiber is the currently accepted name for the taxon (APC 2019). It has previously been referred to as *Dracophyllum* sp. 'Lansdowne' (Brown 97/51) and *Dracophyllum* sp. nov. 'longiflorum' E.A.Brown et N.Streiber (E.A. Brown 97/51) (APC 2019). A reference in Powell (1992) to the occurrence of *Dracophyllum secundum* R.Br. as occurring in the 'Kendall district' relates to *D. macranthum* and derives from collections made in 1929, which for many years were the only exemplars of this species (NSW Scientific Committee 2008).

Distinguished from all other *Dracophyllum* species by the basipetal maturation of the inflorescence (flowers at the top of the inflorescence maturing first), and the long, dark pink corolla tube with white lobes (Brown and Streiber 1999).

Distribution and Abundance

Dracophyllum macranthum is endemic to the lower North Coast of NSW, known only from Coorabakh NP, Comboyne SF, Lansdowne SF, and potentially within adjacent private land holdings. NSW Scientific Committee (2008) suggested that the total range was likely to cover less than 20 km², with a north-south extent of less than 9 km. However, recent surveys have expanded this range to 36 km² (Bell and Sims 2018a), as shown in Figure 1.

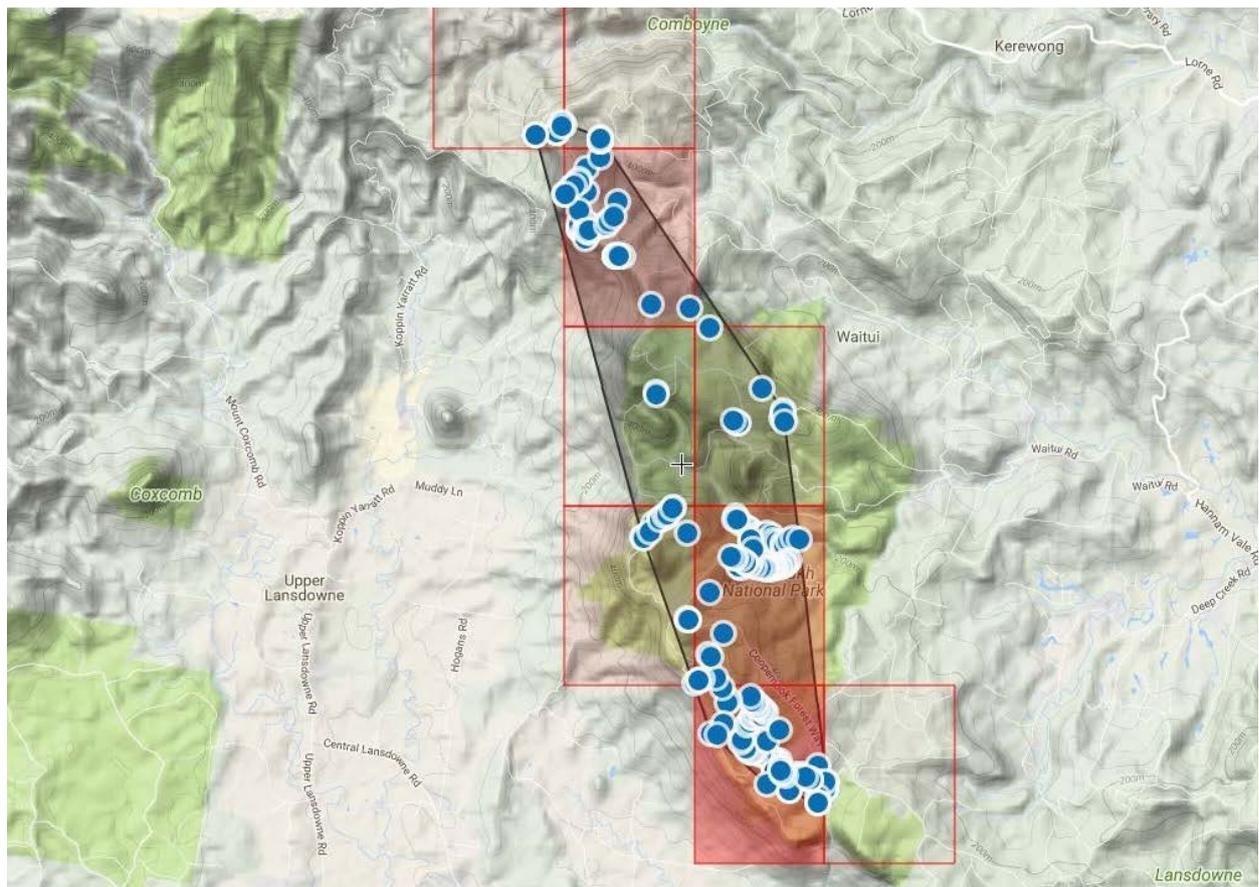


Figure 1. GeoCat distribution of *Dracophyllum macranthum*, shown with AOO (2 km grid cells) and EOO (shaded polygon).

Following targeted surveys across part of the known range (searching 8 km of gorge habitat in two catchments, c. 10% of the likely habitat in Coorabakh NP), Bell and Sims (2018a) estimated a total population size within this search area of between 10,000 and 75,000 individuals. Considering the extent of unsearched habitat within Coorabakh NP and the adjacent Comboyne SF, they estimated a total population size of well over 100,000 individuals.

Ecology

Brown and Streiber (1999) noted habitat as being 'rock outcrops in sheltered stream gullies and damp roadsides, usually in slightly more open areas in the forest'. The more descriptive notes in NSW Scientific Committee (2008) add that *Dracophyllum macranthum* occurs at elevations of 300 to 500m ASL, on loamy soils over conglomerate bedrock and associated sandstones of the Triassic Camden Haven beds. They continue that the species occurs in localised colonies often distributed along linear landscape features such as road cuttings, steep rock drop-offs, and on large sub-canopy conglomerate knolls. Bell (2017) described habitat as primarily the rocky cliffs, outcropping and boulders that are associated with slopes and drainage lines, at numerous locations between Comboyne SF and Lansdowne SF, and including Coorabakh NP. All observed populations of *D. macranthum* occur beneath a canopy of eucalypts (most commonly *Eucalyptus pilularis*) and *Syncarpia glomulifera* with *Allocasuarina torulosa*. Secondary and perhaps opportunistic populations also occur on

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rocky road cuttings where sufficient water seepage is evident for plants to be maintained, and where such water is abundant, aspect does not appear to be a limiting factor. *D. macranthum* is consequently delimited as exclusively lithophytic, and tall cliff lines within remote gorges and at sheltered southerly-to-easterly aspects are clearly the most important habitat for this species (Bell and Sims 2018b).

Previous documentation of habitat (NSW Scientific Committee 2008) also included reference to dry slopes beneath *Eucalyptus pilularis* open forest, but it is suspected that these occurrences actually refer to rocky outcrops or boulders that may be covered in a shallow layer of leaf litter. Likewise, fern banks dominated by *Gleichenia* sp. and *Sticherus* sp., previously considered the most common habitat for *D. macranthum*, does not correspond with recent field observations; the vast majority of plants occur on conglomerate boulders and cliffs in the complete absence of fern banks of these species (Bell and Sims 2018b).

Threats

On its initial listing, NSW Scientific Committee (2008) documented a number of threats potentially impacting on *Dracophyllum macranthum*. These included adverse road maintenance activities, and forestry operations with the associated potential changes to hydrology, introduction of invasive weed species, changes in exposure and fire regimes, and possible introduction of soil- or water-borne pathogens. Most of these threats are associated with the existing trail network within known habitat, however extensive stands of the species are now known from more remote gorges well distant from these influences (Bell and Sims 2018a). Additionally, forestry operations and related disturbances in this region have been dramatically reduced with the gazettal of Coorabakh NP across former timber production forests.

Bell and Sims (2018a) found few or no threats to be operating on the bulk of the population examined by them, and areas where potential threats do operate occupy a very small proportion of the total extent of this species. The number of threat-defined locations, following IUCN Guidelines, is therefore not applicable since the vast majority of the distribution is not under threat.

Weeds

Bell and Sims (2018b) considered the threats from weed species on the habitat of *Dracophyllum macranthum* to be negligible, particularly since few weeds are capable of colonising rocky substrates within intact and remote habitats without major ground disturbances. They found that a small number of weeds (e.g. *Andropogon virginicus*, *Paspalum urvillei*, *Erechtites valerianifolius*) were present along some forestry trails, but these were confined to road edges and the deeper soils accumulating there through trail erosion, and did not penetrate far into the adjoining bushland. One exception to this was a small number of *Andropogon virginicus* and *Nephrolepis cordifolia* plants on a rocky outcrop adjacent to an informal bushwalking track along Starrs Creek. This outcrop also supported *D. macranthum*, but there was no evidence of direct competition between the species. Although a small number of instances were also observed by Bell and Sims (2018b) where *Lantana camara* or *Ageratina adenophora* were present along roadsides, none of these were in close proximity to the larger *D. macranthum* populations in remote gorges.

Phytophthora

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No *Dracophyllum* species are currently known to be at risk from *Phytophthora*, although some studies have shown other epacrids to be highly susceptible, such as *Epacris microphylla*, *E. paludosa*, and *Leucopogon ericoides* (Newby 2014). Surrounding habitat dominated by *Eucalyptus pilularis* may be susceptible to *Phytophthora*, thereby altering the micro-habitat necessary for *Dracophyllum macranthum* survival and growth. However, available evidence suggests only a minimal threat of *Phytophthora* to stands of *Eucalyptus pilularis* given its low susceptibility (O’Gara *et al.* 2005; Keith *et al.* 2012).

Fire

There is at present little scientific knowledge of the ecology of *Dracophyllum macranthum* with respect to fire, however the most common habitat for this species will rarely burn. In view of scant knowledge, it has been suggested that a cautious approach be applied to fire in areas known to support populations of the species (Bell and Sims 2018b). As with its close relative *Dracophyllum secundum* (see Benson and McDougall 1995), *D. macranthum* is expected to be killed by high intensity fire events, with persistence of the population reliant on post-fire seedling emergence and growth under favourable conditions. In experimental studies, Thomas *et al.* (2003) found that *Dracophyllum secundum* and other species inhabiting rarely burnt sites showed very little response to germination cues (heat shock, smoke), suggesting a poorly defined fire response in this species. Across the Tasman, populations of the related *Dracophyllum subulatum* in New Zealand have been shown to be resilient to occasional fire, reaching pre-fire density after 15 years (Smale *et al.* 2011).

Given the moist rocky habitat in which *Dracophyllum macranthum* occurs, fire is not envisaged to pose a major threat to the long-term persistence of populations. A single and intense wildfire burnt across the bulk of the range of this species in October 2009, extending into rainforest and wet sclerophyll forest areas that rarely succumb to fire. Under these conditions, it is expected that many *D. macranthum* individuals on rock faces and cliff lines may have been affected, potentially initiating some seed germination. Field observations in 2018 suggest that many plants in these areas at that time were old and well-established plants and may have escaped scorching during the 2009 event, particularly those in well protected locations deeper in gullies (Bell and Sims 2018b).

Assessment against IUCN Red List criteria

For this assessment it is considered that the survey of *Dracophyllum macranthum* has been adequate and there is sufficient scientific evidence to support the delisting outcome.

Criterion A *Population Size reduction*

Assessment Outcome: Data Deficient

Justification: Available data do not demonstrate an observed, estimated, inferred or suspected decline in population size over 10 years or 3 generations.

Criterion B *Geographic range*

Assessment Outcome: Not Met

Justification: *Dracophyllum macranthum* is endemic to the Coorabakh NP, Comboyne SF, and Lansdowne SF area of the lower North Coast, with an extent of occurrence

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(EOO) and an area of occupancy (AOO) both of 36 km². The EOO (calculated as 14.6 km²) is reported as equal to AOO, despite it being less than the AOO. This is to ensure consistency with the definition of AOO as an area within EOO, following IUCN Guidelines (IUCN 2019). This calculation was based on the species occupying nine (2 x 2 km) grid squares, the spatial scale of assessment recommended by IUCN (2019). An AOO and EOO of 36 km² meets the threshold for Critically Endangered under Criterion B1 (EOO of <100 km²) and Endangered under Criterion B2 (AOO of <500 km²), pending the outcome of following three additional conditions (two of which must be met):

- a) The population or habitat is observed or inferred to be severely fragmented or there is 1 (CR), ≤5 (EN) or ≤10 (VU) locations.

Assessment Outcome: not met

Justification: All known plants occur within a contiguous expanse of habitat that is not fragmented, the majority of which are currently not under threat. Following IUCN Guidelines, assessment against 'location' is not appropriate in this case.

- 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

Assessment Outcome: not met

Justification: Available data do not demonstrate an observed, estimated, inferred or suspect decline in extent of occurrence, area of occupancy, area, extent and/or quality of habitat, number of locations or subpopulations, or number of mature individuals.

- c) Extreme fluctuations.

Assessment Outcome: Extreme fluctuations are unlikely given relatively stable growing conditions on rocky escarpments.

Justification: not met

Criterion C Small population size and decline

Assessment Outcome: Not Met

Justification: The number of mature individuals was estimated by Bell and Sims (2018a) to be well over 10,000 (30% of the observed population were estimated to be mature, meaning > 30,000 mature plants), which exceeds the threshold for vulnerable.

At least one of two additional conditions must be met. These are:

- C1. An observed, estimated or projected continuing decline of at least: 25% in 3 years or 1 generations (whichever is longer) (CE); 20% in 5 years or 2 generations (whichever is longer) (EN); or 10% in 10 years or 3 generations (whichever is longer) (VU).

Assessment Outcome: data deficient

Justification: The available data do not demonstrate observed, estimated or projected continuing decline.

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C2. An observed, estimated, projected or inferred continuing decline in number of mature individuals.

Assessment Outcome: data deficient

Justification: The available data do not demonstrate observed, estimated, projected or inferred continuing decline in number of mature individuals.

In addition, at least 1 of the following 3 conditions:

- a (i). Number of mature individuals in each subpopulation ≤ 50 (CR); ≤ 250 (EN) or ≤ 1000 (VU).

Assessment Outcome: data deficient

Justification: There are no data on the number of mature individuals present within each subpopulation; however, field observations suggest that all subpopulations exceed the 1000 threshold for vulnerable.

- a (ii). % of mature individuals in one subpopulation is 90-100% (CR); 95-100% (EN) or 100% (VU)

Assessment Outcome: data deficient

Justification: There are no data on the proportion of total mature individuals represented by each subpopulation; however, field observations suggest that these thresholds are unlikely to be triggered.

- b. Extreme fluctuations in the number of mature individuals

Assessment Outcome: not met

Justification: Extreme fluctuations are unlikely.

Criterion D Very small or restricted population

Assessment Outcome: Not Met

Justification: The number of mature individuals is estimated to be $>30,000$ (Bell and Sims 2018a), exceeding the threshold for vulnerable.

To be listed as Vulnerable under D, a species must meet at least one of the two following conditions:

- D1. Population size estimated to number fewer than 1,000 mature individuals

Assessment Outcome: not met

Justification: Population size is estimated to be $>30,000$ mature individuals (Bell and Sims 2018a).

- D2. Restricted area of occupancy (typically $<20 \text{ km}^2$) or number of locations (typically <5) with a plausible future threat that could drive the taxon to CR or EX in a very short time.

Assessment Outcome: not met

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Justification: AOO (36 km²) exceeds the threshold of <20 km². Following IUCN Guidelines (IUCN 2019), assessment against 'location' is not appropriate for this species given the lack of plausible current or future threats operating on the bulk of the population.

Criterion E Quantitative Analysis

Assessment Outcome: Data Deficient

Justification: No quantitative analysis has been performed on this species.

Conservation and Management Actions

There is a NSW Saving our Species (SoS) program for this species. The following is derived from the NSW SoS program and threat information, together with suggested management actions in Bell (2017).

Invasive species

- Identify and remove/control *Lantana camara*, *Ageratina* spp. and other invasive weeds along management trails and other disturbed areas.

Ex situ conservation

- Develop a targeted seed collection program for *ex situ* seed banking.

Stakeholder Management

- Inform land owners and managers of sites where there are known populations and consult with these groups regarding options for conservation management and protection of the species.
- Ensure NPWS and State Forests field staff are aware of roadside populations and avoid deleterious management activities in these areas (e.g. weed spraying, trail widening).

Survey and Monitoring priorities

- Regular (yearly) monitoring of selected stands to ensure no additional threats emerge
- Confirmation surveys in currently unexplored gorges to map population extents

Information and Research priorities

- Research into the seed ecology of the species to determine germination requirements, dormancy mechanisms and fire response.
- Research into pollination and reproductive biology, given the lack of knowledge on this aspect of the species ecology.
- Research on impacts of *Phytophthora cinnamomi* on *Dracophyllum macranthum*.

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APPENDIX 1

Assessment against *NSW Biodiversity Conservation Regulation 2017* criteria

The Clauses used for assessment are listed below for reference.

Overall Assessment Outcome

Least Concern

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: Not Met

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,

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		(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 C)**

Assessment Outcome: Not Met

The estimated total number of mature individuals of the species is:			
	(a)	for critically endangered species	very low, or
	(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: Not Met

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

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	(c)	for vulnerable species	low.
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**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: Not Met

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.
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