

Notice and reasons for 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 orchid *Danhatchia copelandii* D.L.Jones & M.A.Clem. as a CRITICALLY ENDANGERED SPECIES in Part 1 of Schedule 1 of the Act. Listing of Critically Endangered species is provided for by Part 4 of the Act.

Summary of Conservation Assessment

Danhatchia copelandii D.L.Jones & M.A.Clem. was found to be Critically Endangered in accordance with the following provisions in the *Biodiversity Conservation Regulation 2017*: Clause 4.3(a)(d)(e i,iii), Clause 4.4(a)(e i,ii,A(l)B), and Clause 4.5(a). The main reasons for the species being eligible are: i) it has a very highly restricted geographic distribution; ii) it has an extremely low population size; iii) all plants are found in one population; (iv) it is severely fragmented and there is only one location; v) there is continuing decline in the quality of habitat and the number of mature individuals, due to threats from herbivory, weeds and increasing severe weather.

The NSW Threatened Species Scientific Committee has found that:

1. *Danhatchia copelandii* is a recently described slender hairy leafless orchid (Jones and Clements 2019). It is described in PlantNET (2023) as a “Rhizomatous, underground, mycoheterotroph. Leaves totally lacking. Inflorescence to 20 cm tall, reddish-brown, bearing numerous short glandular hairs, with 4–5 paler sterile bracts bearing conspicuous red-brown veins. Flowers 2 to 6, each with a closely sheathing elliptical fertile bract, flowers 5–5.5 mm long, segments spreading to 6.5–7.5 mm across, 'opening freely'; dorsal sepal oblong-obovate, 4.5–5 mm long by 1.5 mm wide, brown externally with whitish distal margins, dark median stripe and marginal stripes visible, apex upturned, obtuse; lateral sepals spreading, oblong-elliptical, 5–5.5 mm long by 2 mm wide, asymmetrical, margins incurved, whitish, apex obtuse; petals linear-obovate around 5 mm long and 1 mm wide, cream with pale brown medial band, apex obtuse, imbricate with dorsal sepal and labellum; labellum sessile, margins incurved, enclosed by dorsal sepal, almost broad-oblong, lemon-yellow with cream then hyaline margin, domed orange-yellow callus in distal two-thirds, base pouched and with four groups of fleshy hairs on either side, often in pairs or threes, median line thickened; fleshy and stiff toward tip, and tuberculate externally. Ovary glandular hairy. Capsules erect, broadly obovate.”
2. *Danhatchia copelandii* is endemic to New South Wales and is currently only known from a single population on private land near Coffs Harbour on the NSW north coast (Jones and Clements 2019). It occurs in lowland subtropical rainforest that has a dense canopy to a height of c. 20-25m and a sparse ground layer that is covered with a deep layer of leaf litter (Jones and Clements 2019). Dominant trees in the rainforest are *Sloanea australis* (Maiden's Blush), *Niemeyera whitei* (Rusty Plum) and *Archontophoenix cunninghamiana* (Bangalow Palm). The soil is a moderately fertile clay loam derived from metasediments (L. Copeland *in litt.* May

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2020). *Danhatchia copelandii* may occur in other topographies, vegetation communities and edaphic conditions.

3. The species occurs in 'Lowland Rainforest in the NSW North Coast and Sydney Basin Bioregions' (NSW SC 2011) an Endangered ecological community under the NSW BC Act, and 'Lowlands Rainforest of Subtropical Australia' (DSEWPC 2011), a Critically Endangered Ecological Community under the EPBC Act. The known habitat of *Danhatchia copelandii* is very uncommon in the area where the species occurs (L. Copeland *in litt.* May 2020) and there is relatively little of this vegetation type left in the Coffs Harbour area.
4. The geographic distribution of *Danhatchia copelandii* is very highly restricted. The area of occupancy (AOO) is estimated to be 4 km², based on the species occupying one 2 km x 2 km grid cell, the spatial scale of assessment recommended by IUCN (2022). The extent of occurrence (EOO) is also estimated to be 4 km². The EOO was measured by a minimum convex polygon containing all the known sites of occurrence. When EOO is less than AOO, IUCN (2022) recommend EOO estimates be adjusted to be equal to AOO to ensure consistency with the definition of AOO as an area within EOO.
5. There is an extremely low number of mature individuals of *Danhatchia copelandii*. The total number of *D. copelandii* plants recorded over five flowering seasons (2018 to 2022) varies from 16 to around 40. In 2022, some 36 plants were seen, although 3 of these were later lost to herbivory, most likely from native mammals. Plants seen flowering in one season that did not re-emerge in the following season are not necessarily dead. Rather, they may remain dormant underground, a common phenomenon with orchids with a similar life history.
6. *Danhatchia copelandii* is a mycoheterotroph, meaning that it has no leaves and does not photosynthesise, but instead obtains nutrients from a complex relationship with fungi beneath the ground. For most of the year the orchid lives below ground as a rhizome and in spring may send up small stems that flower very quickly, within 2 weeks of emerging from the soil. The flowers open widely for several days and last for a maximum of 1-2 weeks, then all of the above-ground parts of the plants wither soon afterwards (L. Copeland *in litt.* May 2020). Tiny dust-like seeds develop inside a capsule that dehisces and the seed is dispersed by wind. As the plants are low to the ground and occupy a relatively sheltered environment, the seeds may not disperse far (L. Copeland *in litt.* May 2020). Germination details for the species are unknown.
7. The current main threats to the population of *Danhatchia copelandii* are from weed incursion into the habitat, herbivory, and increased disturbance due to the effects of a changing climate. Extensive historical clearing of rainforest habitat has occurred in the Coffs Harbour area. Many of the sheltered gullies in the broader area that once would have harboured lowland subtropical rainforest have been cleared. Much of what is left of this vegetation type is highly degraded with the weed *Lantana camara* (Lantana) commonly present (L. Copeland *in litt.* November 2020). It is possible *Danhatchia copelandii* may have once occurred elsewhere in rainforest that has now been cleared (L. Copeland *in litt.* May 2020). 'Clearing of native vegetation' is listed as a Key Threatening Process under the Act.

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8. There are a number of introduced weed species that occur in the vicinity of the *Danhatchia copelandii* population and more widely in the surrounding area and nearby State Forest. The main weeds that threaten the species are *Lantana camara* (Lantana), *Ageratum houstonianum* (Billy Goat Weed), *Solanum capsicoides* (Devil's Apple) and *Paspalum mandiocanum* (Broad-leaf Paspalum). Lantana and Broad-leaf Paspalum grow closest to the orchids and are most likely to impact the plants through competition and smothering of plants and seedlings. The weeds are currently being actively managed to prevent their incursion into the rainforest habitat edge. The rainforest canopy where *D. copelandii* currently occurs is intact permitting relatively low levels of light to reach the forest floor which is unfavourable to the rapid growth of the environmental weeds. Should there be a change to the rainforest canopy cover, such as damage from a storm leading to a canopy gap or disease impacting the canopy species, then the threat of competition from weeds would be expected to increase. 'Loss and degradation of native plant and animal habitat by invasion of escaped garden plants, including aquatic plants' is listed as a Key Threatening Process under the Act.
9. Swamp Wallaby (*Wallabia bicolor*), Northern Brown Bandicoot (*Isodon macrourus*) and Bush Rats (*Rattus fuscipes*) are all present in the vicinity of the *Danhatchia copelandii* population. *Danhatchia copelandii* has a very small population size and any localised losses may lead to declines and extinction. In 2022, three plants were lost to native mammal herbivores, most likely the Northern Brown Bandicoot, with the entire plant including the rhizome, dug up and consumed (L. Copeland *in litt.* February 2023). Whilst the herbivory by native species is a natural occurrence, herbivory may be increased in areas of small remnant bushland if herbivores are sustained by surrounding cleared grassy areas. Should rates of plant loss to herbivory increase, there is a risk to the species' persistence.
10. There is a projected increase in the frequency of severe weather events under a changing climate in this region. Severe fire weather is projected to increase during summer and spring in the north coast region of NSW by 2070 (ADAPT NSW 2022). CSIRO (2022) also note a harsher fire-weather climate in the future (high confidence) for the east coast subcluster region. As a holomycotrophic species, a reliance on organic materials including wood debris, which may be eliminated during intense or repeated fires, may contribute to the decline in the species. An increased risk of fires in the habitat is likely to impact the survival of rainforest trees and lead to increased weed establishment, changing the habitat characteristics that currently support the species. There is also a projected increased intensity of extreme rainfall events (with high confidence) in the region (CSIRO 2022). Storms may damage the rainforest canopy, altering the habitat and allowing in additional light which would in turn favour weed invasion of the site (L. Copeland *in litt.* May 2020). Whilst storm damage can naturally lead to gaps in the rainforest canopy and hence provide light for regeneration of many rainforest species, the small area where *D. copelandii* occurs may be adversely affected and more frequent storm events may decrease the recovery time between disturbances. Intense rainfall and subsequent runoff may erode the leaf litter exposing soil and semi-exposed rhizomes (L. Copeland *in litt.* February 2023). The small extent of the population, and the close vicinity of weed species make the population very vulnerable to any

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changes. Anthropogenic Climate Change(s) listed as a Key Threatening Process under the Act.

11. *Danhatchia copelandii* D.L.Jones & M.A.Clem. 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*:

Assessment against *Biodiversity Conservation Regulation 2017* criteria

The Clauses used for assessment are listed below for reference.

Overall Assessment Outcome:

Danhatchia copelandii was found to be Critically Endangered under Clause 4.3(a)(d)(e i,iii); Clause 4.4(a)(e i,ii,A(I)B) and Clause 4.5(a).

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: Critically Endangered under Clause 4.3(a)(d)(e i,iii).

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:	

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	(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 C)

Assessment Outcome: Critically Endangered under Clause 4.4(a)(e i,ii,A(I)B)

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: Critically Endangered under Clause 4.5(a).

The total number of mature individuals of the species is:			
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	(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.
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Chairperson
NSW Threatened Species Scientific Committee

Supporting Documentation:

Scott (2024) Conservation Assessment of *Danhatchia copelandii* D.L.Jones & M.A.Clem. (Orchidaceae). NSW Threatened Species Scientific Committee.

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References:

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Jones DL & Clements MA (2019) *Danhatchia copelandii* (Orchidaceae: Goodyeriales), a newly discovered species of leafless orchid from northern New South Wales. *Australian Orchid Review* **84**(4), 41–43.

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