Notice of the Determination for provisional listing of an endangered species on an emergency basis

The NSW Threatened Species Scientific Committee, established by the *Biodiversity Conservation Act 2016* (the Act), has made a Determination for provisional listing, on an emergency basis, of the species, *Pterostylis pedina* (D.L.Jones) Janes & Duretto (Orchidaceae) as an ENDANGERED SPECIES in Part 2 of Schedule 1 of the Act. Provisional Listing of an Endangered species on an emergency basis is provided for by Part 4 of the Act.

What happens next?

This species will be listed as an Endangered species when the Provisional Listing Determination is published on the Legislation website www.legislation.nsw.gov.au.

In the near future the Committee will make a Preliminary Determination regarding this proposal which will be placed on public exhibition. Public submissions will be invited at that time.

Professor Caroline Gross
Chairperson
NSW Threatened Species Scientific Committee

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The NSW Threatened Species Scientific Committee, established under the *Biodiversity Conservation Act 2016* (the Act), has made a Determination for provisional listing, on an emergency basis, of the species, *Pterostylis pedina* (D.L.Jones) Janes & Duretto (Orchidaceae) as an ENDANGERED SPECIES in Part 2 of Schedule 1 of the Act. Provisional Listing of an Endangered species on an emergency basis is provided for by Part 4 of the Act.

Summary of Conservation Assessment

Pterostylis pedina (D.L.Jones) Janes & Duretto was found to be Endangered in accordance with the following provisions in the *Biodiversity Conservation Regulation 2017*: Clause 4.3(b)(d)(e i,iii) and Clause 4.4(b)(e i,ii B) because: 1) it has a highly restricted geographic distribution with an estimated area of occupancy of 24 km^2 and an estimated extent of occurrence of ~141 km^2; 2) the estimated number of mature individuals is low (1,100–2,700) and 95% may occur in one subpopulation; (3) it occurs in two threat-defined locations; and 4) there is an inferred continuing decline in the number of mature individuals, and the area, extent, and quality of habitat attributed to digging and grazing by introduced fauna, and modification and disturbance from agriculture and infrastructure development.

The NSW Threatened Species Scientific Committee has found that:

1. *Pterostylis pedina* (D.L.Jones) Janes & Duretto (family Orchidaceae), commonly known as the Burrabogie rustyhood or plains rustyhood, is described in Jones (2021) as “Plants growing in clumps. Rosette leaves 8–12, oblong to elliptic, 10–43 x 5–12 mm, margins minutely ciliate. Flower stem 70–200 mm tall, 2 mm across, 1–6-flowered. Stem bracts 3–4. Flowers porrect to suberect, 30–35 x 9–11 mm, translucent white with green or light brown bands and markings. Dorsal sepal point filamentous, 8–12 mm long, porrect to upcurved. Lateral sepals wider than hood, shallowly concave, margins flat, densely hairy; free points filamentous, 14–25 mm long, divergent. Petals transparent, with large basal flanges that nearly meet, 12–14 x 4–4.5 mm. Labellum elliptic, 5–5.8 x 2.5 mm, thin-textured, green to light brown, tapered to base where constricted, apex flat; margins flat, with 16–22 spreading white bristles to 1.3 mm long; two prominent bristles c. 4 mm long projecting from near base; basal lobe thin, sloping backwards, glabrous or with few short bristles”. The basionym for this taxon is *Oligochaetochilus pedinus* (Jones 2009), however, *Pterostylis pedina* is the currently accepted name (CHAH 2018).

2. *Pterostylis pedina* is currently known to occur in two subpopulations within the Murrumbidgee subregion of the Riverina in south-west New South Wales (NSW) (Commonwealth DCCEEW 2024): 1) South-west of Oolambeyan National Park (NP) on a private property known as ‘South Burrabogie’; and 2) in Yanga State Conservation Area (SCA), approximately 119 km west of the Burrabogie subpopulation. There have been unsuccessful targeted searches for this species

in potential habitat at other sites in Yanga SCA, on the Hay Plains, in Oolambeyan NP, and in Terrick Terrick NP (Victoria) (B. Kosky, D. Egan, and G. Bradburn *in litt*. October 2024).

3. There are an estimated 1,100–2,700 mature *Pterostylis pedina* individuals with ~59–95% occurring in the Yanga subpopulation. Surveyors of the Yanga subpopulation report an estimated total number of "perhaps a thousand or more" (Kosky 2021); a low confidence estimate of 1,000–2,000 individuals (D. Egan *in litt*. October 2024); and "thousands of plants spread over many hundreds of square metres" (M. and C. Beamish *in litt.* October 2024). Due to access restrictions, the current status of the Burrabogie subpopulation is uncertain (D. Egan *in litt*. June 2022). Fewer than 100 flowering individuals were counted in the Burrabogie subpopulation in spring 2003 (N. Reid, pers. comm. in D. Egan *in litt*. June 2022), but it was described as growing in "localised clumps that can consist of several hundred orchid plants distributed over several acres" (Jones 2009). At the time of writing, there have been no opportunistic observations of this species in surveys for proposed renewable energy projects in the South Burrabogie locality (RPS 2023; Biosis 2024a; Umwelt 2024), or anywhere else across the species' range (Biosis 2017a, 2017b; WSP 2021, Biosis 2022; WSP 2023; Biosis 2024b; Cumberland Ecology 2024; ERM 2024a, 2024b, 2024c, 2024d, 2024e; NGH 2024).

4. *Pterostylis pedina* has an estimated area of occupancy (AOO) of 24 km^2, and an estimated extent of occurrence (EOO) of ~141 km^2. As recommended by IUCN (2024), AOO is based on 2 x 2 km grid cells, while EOO is based on a minimum convex polygon enclosing mapped records for the species (ALA 2024; D. Egan *in litt*. October 2024; NSW Government 2024).

5. At South Burrabogie *Pterostylis pedina* was found along narrow (10–50 m wide) outcrops of red-brown clay loam bordering black cracking clay (Jones 2009). In years of good rainfall these sites also contain annual forbs and grasses, but otherwise, apart from small forbs, are devoid of vegetation (N. Reid, pers. comm. in Jones 2009). The species occurs in similar habitat in Yanga SCA: on hard, red brown clay soils with a well-developed cryptogamic crust (D. Egan *in litt*. October 2024). These patches typically have less grass biomass, dominated by *Rytidosperma* sp. (wallaby grass) and *Austrostipa* sp. (spear grass), scattered *Maireana aphylla* (cotton bush) and herbs, and have a greater inter-tussock space than the surrounding grey, self-mulching soils (D. Egan *in litt*. October 2024).

6. The emergence of *Pterostylis pedina* from its dormant underground state varies between years (M. and C. Beamish *in litt.* October 2024). Following suitable autumn and winter rains, the underground tuber produces a leaf rosette (D. Egan *in litt*. June 2022). Subsequently, flowering occurs in October and November (Jones 2009), or as early as September, depending on the seasonal weather conditions (M. and C. Beamish *in litt*. October 2024). Some individuals may be sterile (*i.e*., only produce the rosette, Janes and Duretto 2010), and not all fertile plants will flower in a given season (D. Egan *in litt*. June 2022). In dry years, flowering may only be sporadic or not occur at all (Copeland and Backhouse 2022; N. Smith *in litt*. October 2024).

7. Based on studies of morphologically similar *Pterostylis* species (Phillips *et al.* 2014; Reiter *et al.* 2019), the inferred mechanism of pollination for *Pterostylis pedina* is sexual deception of male fungus gnats (Keroplatidae and Mycetophilidae). The availability of fungus gnats to pollinate *P. pedina* may vary widely across a landscape according to the presence of the pollinators' preferred habitat (Reiter *et al.* 2019), which is currently unknown.

8. *Pterostylis pedina* belongs within the taxonomic section '*Oligochaetochilus*' that typically reproduces from seed and does not form vegetative colonies via the production of multiple daughter tubers, as is observed in some other *Pterostylis* species (Jones and Clements 2002; Janes and Duretto 2010). Individual *P. pedina* are inferred to have a continuous lifespan through successive tuber renewals, where each year the senescing parent tuber is replaced by a single daughter tuber that grows close to the parent (Jones and Clements 2002). Generation length is unknown.

9. Orchids produce many tiny balloon-like seeds that are easily dispersed by wind and water, and may also be transported by animals in their fur, feathers, or muddy feet (Arditti and Ghani 2000). Most seeds remain in close proximity to the parent plant (D. L. Jones, pers. obs. in Jones and Clements 2002). However, evidence of maintained gene flow between disjunct sites occupied by *Pterostylis gibbosa* (Sharma *et al.* 2000) suggests that dispersal of *P. pedina* seeds beyond the parent site is likely to occur. It is inferred that successful seed germination and seedling establishment relies on colonisation by specific types of mycorrhizal fungi, with which they form symbiotic relationships that support their growth (Warcup 1981; Jusaitis and Sorensen 1993; Weston *et al.* 2005). Rainfall variability may alter the type of mycorrhizal fungi inhabiting the orchids (or available in the environment), which in turn influences whether seed germination, growth, and flowering would occur (Jones and Clements 2002; Jasinge *et al.* 2018; Bell 2022).

10. There is an inferred continuing decline in the area, extent, and quality of habitat for *Pterostylis pedina* because the species occurs in a region that has been modified for irrigated cropping (D. Egan *in litt*. June 2022) and is now the subject of many approved and proposed renewable energy projects (RPS 2023; Biosis 2024a; Umwelt 2024; Biosis 2017a, 2017b; WSP 2021, Biosis 2022; WSP 2023; Biosis 2024b; Cumberland Ecology 2024; ERM 2024a, 2024b, 2024c, 2024d, 2024e; NGH 2024). The project area for the Bullawah Wind Farm encompasses the approximate location of the Burrabogie subpopulation (Umwelt 2024), and other projects are between approximately 1.4–49 km of the species' records. Disturbances associated with construction on, or adjacent to this species' habitat may render it unsuitable through changes to soil structure, water infiltration or surface flows, or the presence of suitable mycorrhizal fungi. Additionally, in the most recent status review for Yanga SCA, it was recommended that it remain an SCA to allow further exploration of the mineral values of the land, subject to environmental assessment (OEH 2014). Construction of high voltage energy transmission lines through a portion of Yanga SCA (south of the currently known *P. pedina* records) was approved (NSW Government 2022). 'Clearing of native vegetation' is listed as a Key Threatening Process under the NSW *Biodiversity Conservation Act 2016*.

11. It is inferred that the activities of introduced fauna contribute to continuing decline in the number of mature individuals, and the area, extent, and quality of habitat for *Pterostylis pedina*. Both rabbits (*Oryctolagus cuniculus*) and feral pigs (*Sus scrofa*) may consume the flowers, rosettes, and tubers of *P. pedina*, disturb the soil surface through digging, and increase grazing pressure on surrounding vegetation, which could contribute to wind erosion and loss of topsoil (D. Egan *in litt*. June 2022). Rabbits have been observed digging up *Caladenia saggicola* (sagg spider orchid) tubers (Threatened Species Section 2017), and pig diggings have been detected in the vicinity of *P. pedina* (D. Egan *in litt*. October 2024). Heavy grazing by domestic sheep and cattle may similarly adversely affect this species (D. Egan *in litt*. June 2022). 'Predation, habitat degradation, competition and disease transmission by feral pigs, *Sus scrofa* Linnaeus 1758' and 'Competition and grazing by the feral European rabbit, *Oryctolagus cuniculus (L.)*' are listed as Key Threatening Processes under the NSW *Biodiversity Conservation Act 2016*.

12. *Pterostylis pedina* occurs in two threat-defined locations, which are equal to the two known subpopulations for the species. The most serious plausible threat that could rapidly affect all individuals in a location is habitat modification and disturbance for agriculture or infrastructure development.

13. *Pterostylis pedina* (D.L.Jones) Janes & Duretto is not eligible to be listed as a Critically Endangered species.

14. Under the *Biodiversity Conservation Act* 2016 a species is eligible to be provisionally listed as, in the opinion of the NSW Threatened Species Scientific Committee:
    (a) the species:
        (i) although not previously known to have existed in New South Wales, is believed on current knowledge to be native to New South Wales, or
        (ii) is subject to an immediate and significant threat of extinction, or
        (iii) was presumed to be extinct or extinct in the wild but has been rediscovered, and
    (b) the species is not listed in Schedule 1 as an endangered or critically endangered species.

15. *Pterostylis pedina* (D.L.Jones) Janes & Duretto is eligible to be listed as an Endangered species as, in the opinion of the NSW Threatened Species Scientific Committee, it is subject to an immediate and significant threat of extinction.

Assessment against *Biodiversity Conservation Regulation 2017* criteria
The Clauses used for assessment are listed below for reference.

Overall Assessment Outcome:
Pterostylis pedina was found to be Endangered under Clause 4.3(b)(d)(e i,iii) and Clause 4.4(b)(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,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:	
		(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: Endangered under Clause 4.4(b)(e i,ii 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: 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
	(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.

Professor Caroline Gross
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NSW Threatened Species Scientific Committee

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