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Notice of 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 *Caladenia tessellata* Fitzg. as a VULNERABLE SPECIES in Part 3 of Schedule 1 of the Act and, as a consequence, to omit reference to *Caladenia tessellata* Fitzg. from Part 2 of Schedule 1 (Endangered species) of the Act. Listing of Vulnerable species is provided for by Part 4 of the Act.

The NSW Threatened Species Scientific Committee is satisfied that *Caladenia tessellata* Fitzg. has been duly assessed by the Commonwealth Threatened Species Scientific Committee under the Common Assessment Method, as provided by Section 4.14 of the Act. After due consideration of Commonwealth DCCEEW (2023), the NSW Threatened Species Scientific Committee has made a decision to list the species as Vulnerable.

Summary of Conservation Assessment

Caladenia tessellata Fitzg. was found to be Vulnerable in accordance with the following provisions in the *Biodiversity Conservation Regulation 2017*: Clause 4.4 (c)(e i,ii A(III)) because: (1) the species has a moderately low total number of mature individuals, estimated to be 1,800–2,500 plants; (2) there is a low number of individuals (<1,000) in each subpopulation of the species; and (3) continuing decline in the number of mature individuals is inferred due to the physical destruction of a number of subpopulations as a result of urban development.

The NSW Threatened Species Scientific Committee has found that:

1. *Caladenia tessellata* Fitzg. (family Orchidaceae) is a perennial, terrestrial, herbaceous orchid, emerging annually from an underground tuber. It has a single, hairy, linear-lanceolate leaf to 10 cm long, which emerges in autumn. Flowering plants produce a slender, hairy, wiry flower stem to 30 cm tall which bears one or two small (to 3 cm across) yellowish-green flowers with maroon stripes and suffusions. The flowers have two lateral sepals and two petals, each 14–16 mm long, decurved at the base of the flower. The dorsal sepal is 14–16 mm long, erect and curved forward over a 7–8 mm long column, with the stigma and anther situated toward the apex of the column. The labellum features four to six rows of glossy purple to black, thick, clubbed calli (non-secreting glands) which are c.1.3 mm tall and densely packed at the base of the labellum, with two to four (or six) rows extending almost to the apex (Duncan 2010, VicFlora 2015, Jones 2021, PlantNet 2021).
2. *Caladenia tessellata* is endemic to mainland south-eastern Australia, where it is distributed from the south coast of New South Wales (NSW) to the eastern outskirts of Melbourne. The species usually occurs on or near the coast, but in southern NSW it extends inland to near Braidwood. In NSW, the species is known from subpopulations at Morton National Park and near Braidwood, while a third subpopulation was recently discovered in Nadgee Nature Reserve near the border

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with Victoria (D. Bain pers. comm. September 2021) and a few plants were discovered recently near Ulladulla (K. Coutts-McClelland pers. comm. February 2022). It was previously known to occur on the Central Coast near Swansea and Wyong, and at another subpopulation near Ulladulla; however, it has not been seen at these locations since the late 1990s or early 2000s, despite regular searches by people who are familiar with the sites (NSW Scientific Committee 2008, Duncan 2010, L. Copeland pers. comm. September 2021). The species was historically known from the Sydney and Jervis Bay regions, but these subpopulations were destroyed by urban development in the mid-20th century (NSW Scientific Committee 2008). In Victoria, the species is known from 16 extant subpopulations in near-coastal areas throughout Gippsland, from Croajingolong National Park in the state's far east to the outskirts of Melbourne (Duncan 2010).

3. The geographic distribution of *Caladenia tessellata* is highly restricted. While the extent of occurrence (EOO) is estimated to be 70,000–80,000 km², the area of occupancy (AOO) is estimated to be only 150–200 km². The EOO was calculated using a minimum convex hull and the AOO was calculated using a 2x2 km grid cell method, the methods of assessment recommended by IUCN (2024).
4. The number of mature individuals of *Caladenia tessellata* is estimated to be 1,800–2,500. Comprehensive survey data from the 2020 season covered all major fire-affected subpopulations and, given the reasonably good rainfall, is likely to represent an accurate estimate of current numbers at those subpopulations (R. Phillips pers. comm. September 2021). The number of mature individuals in the largest subpopulation is an estimated 1014 individuals at Morton National Park, though the actual number is potentially less than 1000, given sampling error and interannual variability in numbers.
5. *Caladenia tessellata* grows in a variety of habitats. In NSW, the species is found in grassy dry sclerophyll woodland on clay loam or sandy soils, or in heathland on sandy loam.
6. *Caladenia tessellata* flowers in September and October. Like many other spider-orchids, it is sexually deceptive and pollinated by male thynnine wasps (Hymenoptera, Tiphiidae) (Phillips *et al.* 2009). Sexually deceptive spider-orchids typically have only one species of pollinator (Phillips *et al.* 2017). The likely pollinator of *C. tessellata* is a *Phymatothynnus* species allied to *P. nitidus*, however further research is needed to confirm this (Phillips *et al.* 2009). Sexually deceptive orchids tend to have low rates of fruit set that are typically pollinator-limited (Phillips *et al.* 2009).
7. Spider-orchids typically reproduce from seed (Backhouse and Jeanes 1995), or occasionally via vegetative propagation (Dixon and Tremblay 2009). Seed germination only occurs after successful infection by mycorrhizal fungi of the genus *Serendipita* (Warcup 1981, Reiter *et al.* 2020). The seed is short-lived in the soil seed bank and only lasts for one growing season (Dixon and Tremblay 2009).
8. Flowering of *Caladenia tessellata* is likely promoted by summer fires (Jones 2021). Approximately 100 flowering plants were known at the Morton National Park site as at 2019 (K. Coutts-McClelland pers. comm. September 2021) but over 1000 flowering individuals were counted in September 2020 after the 2019-20 bushfires burnt the area (R. Phillips pers. comm. September 2021). Although flowering is

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likely stimulated by summer fire, the impact of fire on the total number of individuals is unknown. Other spider-orchids are known to flower vigorously following hot summer fires (Backhouse and Jeanes 1995; Todd 2000), although this may be as much the result of the removal of surrounding vegetation, increased water and nutrients and reduced competition as any chemical or physical effect of the fire (Backhouse and Jeanes 1995). The timing of fire for orchids is important, with the most ecologically suitable timing of fires for population persistence being summer or early autumn, during the dormant period after seed dispersal, but prior to leaf emergence (Jasinge *et al.* 2018). In addition to fire, variation in seasonal climatic conditions, most notably rainfall and temperature, also influences flowering. Flowering is often aborted when periods of sustained hot, dry weather follow flower opening (Todd 2000).

9. The main threats to *Caladenia tessellata* are habitat destruction due to development and road and track maintenance, adverse fire regimes, loss of pollination services, and increasing frequency of drought and changes in precipitation due to climate change. 'Clearing of native vegetation', 'High frequency fire resulting in the disruption of life cycle processes in plants and animals and loss of vegetation structure and composition' and 'Anthropogenic climate change' are listed as Key Threatening Processes under the Act.
10. Continuing decline is inferred in the number of mature individuals of *Caladenia tessellata* due to urban development. Urban development is the cause of historic decline and subpopulation destruction around Sydney, Jervis Bay and Ulladulla (NSW Scientific Committee 2008, Duncan 2010). More recently, the subpopulation at Ulladulla may have been adversely affected by roadworks in 2010 (Duncan 2010). The lack of subsequent observations at these subpopulations, despite regular searches, suggests local extinctions and loss of mature individuals has taken place.
11. *Caladenia tessellata* Fitzg. is not eligible to be listed as an Endangered or Critically Endangered species.
12. *Caladenia tessellata* Fitzg. is eligible to be listed as a Vulnerable species as, in the opinion of the NSW Threatened Species Scientific Committee, it is facing a high risk of extinction in Australia in the medium-term 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: Vulnerable under Clause 4.4 (c)(e i,ii A(III))

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

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	(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,
		(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: Vulnerable under Clause 4.4 (c)(e i,ii A(III))

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,

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	(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: 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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Chairperson
NSW Threatened Species Scientific Committee

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Supporting Documentation:

Commonwealth DCCEEW (Department of Climate Change, Energy, the Environment and Water) (2023). Conservation Advice for *Caladenia tessellata* (thick-lipped spider orchid). Australian Government, Canberra, ACT.

References:

Backhouse GN, Jeanes J (1995) *The Orchids of Victoria*. Melbourne University Press, Carlton.

Dixon K, Tremblay RL (2009) Biology and natural history of *Caladenia*. *Australian Journal of Botany* **57**: 247–258.

Duncan M (2010) *National Recovery Plan for the Thick-lip Spider-orchid Caladenia tessellata*. Department of Sustainability and Environment, Melbourne. URL: <https://www.awe.gov.au/system/files/resources/f9bc9c67-5a06-4fc6-a39d-3d1571de142b/files/caladenia-tessellata.pdf>

IUCN Standards and Petitions Subcommittee (2022). Guidelines for Using the IUCN Red List Categories and Criteria. Version 15.1 (July 2022). Standards and Petitions Committee of the IUCN Species Survival Commission. IUCN, Gland, Switzerland and Cambridge, UK.

Jasinge NU, Huynh T, Lawrie AC (2018) Consequences of season of prescribed burning on two spring-flowering terrestrial orchids and their endophytic fungi. *Australian Journal of Botany* **66**: 298–312.

Jones DL (2021) *A Complete Guide to Native Orchids of Australia 3rd edition*. Reed New Holland, Sydney.

NSW Scientific Committee (2008) *Caladenia tessellata* Review of current information in NSW. May 2008. Unpublished report arising from the Review of the Schedules of the Threatened Species Conservation Act 1995. NSW Scientific Committee, Hurstville. URL: <https://www.environment.nsw.gov.au/-/media/OEH/Corporate-Site/Documents/Animals-and-plants/Scientific-Committee/sc-caladenia-tessellata-fitzg-review-report.pdf?la=en&hash=1F5167A9C4E836913A2057F51F15F66C46CC59C8>

Phillips RD, Faast R, Bower CC, Brown GR, Peakall R (2009) Implications of pollination by food and sexual deception for pollinator specificity, fruit set, population genetics and conservation of *Caladenia* (Orchidaceae). *Australian Journal of Botany* **57**: 287–306.

Phillips RD, Brown GR, Dixon KW, Hayes C, Linde CC, Peakall R (2017) Evolutionary relationships among pollinators and repeated pollinator sharing in sexually deceptive orchids. *Journal of Evolutionary Biology* **30**: 1674–1691.

PlantNet (2021) New South Wales Flora Online page for *Caladenia tessellata*. URL: <https://plantnet.rbgsyd.nsw.gov.au/cgi-bin/NSWfl.pl?page=nswfl&lvl=sp&name=Caladenia~tessellata> (accessed 15 September 2021).

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Reiter N, Phillips RD, Swarts ND, Wright M, Holmes G, Sussmilch FC, Davis BJ, Whitehead MR, Linde CC (2020) Specific mycorrhizal associations involving the same fungal taxa in common and threatened *Caladenia* (Orchidaceae): implications for conservation. *Annals of Botany* **126**: 943–955.

Todd JA (2000) *Recovery plan for twelve threatened Spider-orchid Caladenia taxa (Orchidaceae: Caladeniinae) of Victoria and South Australia 2000-2004*. Department of Natural Resources and Environment, Melbourne.

VicFlora (2015) Flora of Victoria online page for *Caladenia tessellata*. URL: <https://vicflora.rbg.vic.gov.au/flora/taxon/1433ef33-f9c2-42f5-b812-d88027be570e> (accessed 15 September 2021)

Warcup JH (1981) The mycorrhizal relationships of Australian orchids. *New Phytologist* **87**: 371–381.