Australian Government
Department of Agriculture, Water and the Environment

Consultation on Species Listing Eligibility and Conservation Actions

Caladenia tessellata

You are invited to provide your views and supporting reasons related to:

1) the eligibility of *Caladenia tessellata* for inclusion on the EPBC Act threatened species list in the Vulnerable category; and

2) the necessary conservation actions for the above species.

The purpose of this consultation document is to elicit additional information to better understand the status of the species and help inform on conservation actions and further planning. As such, the below draft assessment should be considered to be **tentative** as it may change following responses to this consultation process.

Evidence provided by experts, stakeholders and the general public are welcome. Responses can be provided by any interested person.

Anyone may nominate a native species, ecological community or threatening process for listing under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) or for a transfer of an item already on the list to a new listing category. The Threatened Species Scientific Committee (the Committee) undertakes the assessment of species to determine eligibility for inclusion in the list of threatened species and provides its recommendation to the Australian Government Minister for the Environment.

Responses are to be provided in writing by email to: species.consultation@awe.gov.au

Please include species scientific name in Subject field.

or by mail to:

The Director
Bushfire Affected Species Assessments Section
Department of Agriculture, Water and the Environment
John Gorton Building, King Edward Terrace
GPO Box 858
Canberra ACT 2601

Responses are required to be submitted by 1 February 2022.

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General background information about listing threatened species

The Australian Government helps protect species at risk of extinction by listing them as threatened under Part 13 of the EPBC Act. Once listed under the EPBC Act, the species becomes a Matter of National Environmental Significance (MNES) and must be protected from significant impacts through the assessment and approval provisions of the EPBC Act. More information about threatened species is available on the department's website at: https://www.awe.gov.au/environment/biodiversity/threatened/recovery-plans.

Public nominations to list threatened species under the EPBC Act are received annually by the department. In order to determine if a species is eligible for listing as threatened under the EPBC Act, the Threatened Species Scientific Committee (the Committee) undertakes a rigorous scientific assessment of its status to determine if the species is eligible for listing against a set of criteria. These criteria are available on the Department's website at: https://www.awe.gov.au/sites/default/files/env/pages/d72dfd1a-f0d8-4699-8d43-5d95bbb02428/files/tssc-guidelines-assessing-species-2021.pdf.

As part of the assessment process, the Committee consults with the public and stakeholders to obtain specific details about the species, as well as advice on what conservation actions might be appropriate. Information provided through the consultation process is considered by the Committee in its assessment. The Committee provides its advice on the assessment (together with comments received) to the Minister regarding the eligibility of the species for listing under a particular category and what conservation actions might be appropriate. The Minister decides to add, or not to add, the species to the list of threatened species under the EPBC Act. More detailed information about the listing process is at: https://www.awe.gov.au/environment/biodiversity/threatened/nominations.

To promote the recovery of listed threatened species and ecological communities, conservation advices and where required, recovery plans are made or adopted in accordance with Part 13 of the EPBC Act. Conservation advices provide guidance at the time of listing on known threats and priority recovery actions that can be undertaken at a local and regional level. Recovery plans describe key threats and identify specific recovery actions that can be undertaken to enable recovery activities to occur within a planned and logical national framework. Information about recovery plans is available on the department's website at: https://www.awe.gov.au/environment/biodiversity/threatened/recovery-plans.

Privacy notice

The Department will collect, use, store and disclose the personal information you provide in a manner consistent with the Department's obligations under the Privacy Act 1988 (Cth) and the Department's Privacy Policy.

Any personal information that you provide within, or in addition to, your comments in the threatened species assessment process may be used by the Department for the purposes of its functions relating to threatened species assessments, including contacting you if we have any questions about your comments in the future.

Further, the Commonwealth, State and Territory governments have agreed to share threatened species assessment documentation (including comments) to ensure that all States and Territories have access to the same documentation when making a decision on the status of a potentially threatened species. This is also known as the 'Common Assessment Method' (CAM). As a result, any personal information that you have provided in connection with your comments may be shared between Commonwealth, State or Territory government entities to assist with their assessment processes.

The Department's Privacy Policy contains details about how respondents may access and make corrections to personal information that the Department holds about the respondent, how respondents may make a complaint about a breach of an Australian Privacy Principle, and how the Department will deal with that complaint. A copy of the Department's Privacy Policy is available at: https://www.awe.gov.au/about/commitment/privacy .

Information about this consultation process

Responses to this consultation can be provided electronically or in hard copy to the contact addresses provided on Page 1. All responses received will be provided in full to the Committee and then to the Australian Government Minister for the Environment.

In providing comments, please provide references to published data where possible. Should the Committee use the information you provide in formulating its advice, the information will be attributed to you and referenced as a 'personal communication' unless you provide references or otherwise attribute this information (please specify if your organisation requires that this information is attributed to your organisation instead of yourself). The final advice by the Committee will be published on the department's website following the listing decision by the Minister.

Information provided through consultation may be subject to freedom of information legislation and court processes. It is also important to note that under the EPBC Act, the deliberations and recommendations of the Committee are confidential until the Minister has made a final decision on the nomination, unless otherwise determined by the Minister.

CONSULTATION QUESTIONS FOR *Caladenia tessellata* (thick-lipped spider-orchid)

SECTION A - GENERAL

1. Is the information used to assess the nationally threatened status of the species/subspecies robust? Have all the underlying assumptions been made explicit? Please provide justification for your response.

2. Can you provide additional data or information relevant to this assessment?

3. Have you been involved in previous state, territory or national assessments of this species/subspecies? If so, in what capacity?

PART 1 – INFORMATION TO ASSIST LISTING ASSESSMENT

SECTION B DO YOU HAVE ADDITIONAL INFORMATION ON THE ECOLOGY OR BIOLOGY OF THE SPECIES/SUBSPECIES? (If no, skip to section C)

Biological information

4. Can you provide any additional or alternative references, information or estimates on longevity, average life span and generation length?

5. Do you have any additional information on the ecology or biology of the species/subspecies not in the current advice?

SECTION C ARE YOU AWARE OF THE STATUS OF THE TOTAL NATIONAL POPULATION OF THE SPECIES/SUBSPECIES? (If no, skip to section D)

Population size

6. Has the survey effort for this taxon been adequate to determine its national adult population size? If not, please provide justification for your response.

7. Do you consider the way the population size has been derived to be appropriate? Are there any assumptions and unquantified biases in the estimates? Did the estimates measure relative or absolute abundance? Do you accept the estimate of the total

population size of the species/subspecies? If not, please provide justification for your response.

8. If not, can you provide a further estimate of the current population size of mature adults of the species/subspecies (national extent)? Please provide supporting justification or other information.

   If, because of uncertainty, you are unable to provide a single number, you may wish to provide an estimated range. If so, please choose one of the ranges suggested in the table below of possible species/subspecies numbers, and also choose the level of confidence you have in this estimate:

   Number of mature individuals is estimated to be in the range of:

   ☐ 1–50 ☐ 51–250 ☐ 251–1000 ☐ >1000 ☐ >10 000

   Level of your confidence in this estimate:

   ☐ 0–30% - low level of certainty/ a bit of a guess/ not much information to go on

   ☐ 31–50% - more than a guess, some level of supporting evidence

   ☐ 51–95% - reasonably certain, information suggests this range

   ☐ 95–100% - high level of certainty, information indicates quantity within this range

   ☐ 99–100% - very high level of certainty, data are accurate within this range

SECTION D ARE YOU AWARE OF TRENDS IN THE OVERALL POPULATION OF THE SPECIES/SUBSPECIES? (If no, skip to section E)

9. Does the current and predicted rate of decline used in the assessment seem reasonable? Do you consider that the way this estimate has been derived is appropriate? If not, please provide justification of your response.

Evidence of total population size change

10. Are you able to provide an estimate of the total population size during the early 1960s *(at or soon after the start of the most recent three generation period)*? Please provide justification for your response.

    If, because of uncertainty, you are unable to provide a single number, you may wish to provide an estimated range. If so, please choose one of the ranges suggested in the table below of possible species/subspecies numbers, and also choose the level of confidence you have in this estimate.

    Number of mature individuals is estimated to be in the range of:

    ☐ 1–50 ☐ 51–250 ☐ 251–1000 ☐ >1000 ☐ >10 000

Level of your confidence in this estimate:

☐ 0–30% - low level of certainty/ a bit of a guess/ not much information to go on

☐ 31–50% - more than a guess, some level of supporting evidence

☐ 51–95% - reasonably certain, information suggests this range

☐ 95–100% - high level of certainty, information indicates quantity within this range

☐ 99–100% - very high level of certainty, data are accurate within this range

11. Are you able to comment on the extent of decline in the species/subspecies' total population size over the last approximately 60 years (i.e. three generations)? Please provide justification for your response.

    If, because of uncertainty, you are unable to provide an estimate of decline, you may wish to provide an estimated range. If so, please choose one of the ranges suggested in the table below of ranges of decline, and also choose the level of confidence you have in this estimated range.

    Decline estimated to be in the range of:

    ☐ 1–30% ☐31–50% ☐51–80% ☐81–100% ☐90–100%

    Level of your confidence in this estimated decline:

    ☐ 0–30% - low level of certainty/ a bit of a guess/ not much information to go on

    ☐ 31–50% - more than a guess, some level of supporting evidence

    ☐ 51–95% - reasonably certain, suggests this range of decline

    ☐ 95–100% - high level of certainty, information indicates a decline within this range

    ☐ 99–100% - very high level of certainty, data are accurate within this range

12. Please provide (if known) any additional evidence which shows the population is stable, increasing or declining.

SECTION E ARE YOU AWARE OF INFORMATION ON THE TOTAL RANGE OF THE SPECIES/SUBSPECIES? (If no, skip to section F)

Current Distribution/range/extent of occurrence, area of occupancy

13. Does the assessment consider the entire geographic extent and national extent of the species/subspecies? If not, please provide justification for your response.

14. Has the survey effort for this species/subspecies been adequate to determine its national distribution? If not, please provide justification for your response.

15. Is the distribution described in the assessment accurate? If not, please provide justification for your response and provide alternate information.

16. Do you agree that the way the current extent of occurrence and/or area of occupancy have been estimated is appropriate? Please provide justification for your response.

17. Can you provide estimates (or if you disagree with the estimates provided, alternative estimates) of the extent of occurrence and/or area of occupancy.

    If, because of uncertainty, you are unable to provide an estimate of extent of occurrence, you may wish to provide an estimated range. If so, please choose one of the ranges suggested in the table below of ranges of extent of occurrence, and also choose the level of confidence you have in this estimated range.

    Current extent of occurrence is estimated to be in the range of:

    ☐ <100 km^2 ☐ 100 – 5 000 km^2 ☐ 5 001 – 20 000 km^2 ☐ >20 000 km^2

    Level of your confidence in this estimated extent of occurrence

    ☐ 0–30% - low level of certainty/ a bit of a guess/ not much data to go on

    ☐ 31–50% - more than a guess, some level of supporting evidence

    ☐ 51–95% - reasonably certain, data suggests this range of decline

    ☐ 95–100% - high level of certainty, data indicates a decline within this range

    ☐ 99–100% - very high level of certainty, data is accurate within this range

If, because of uncertainty, you are unable to provide an estimate of area of occupancy, you may wish to provide an estimated range. If so, please choose one of the ranges suggested in the table below of ranges of area of occupancy, and also choose the level of confidence you have in this estimated range.

Current area of occupancy is estimated to be in the range of:

☐ <10 km^2 ☐ 11 – 500 km^2 ☐ 501 – 2000 km^2 ☐ >2000 km^2

Level of your confidence in this estimated extent of occurrence:

☐ 0–30% - low level of certainty/ a bit of a guess/ not much data to go on

☐ 31–50% - more than a guess, some level of supporting evidence

☐ 51–95% - reasonably certain, data suggests this range of decline

☐ 95–100% - high level of certainty, data indicates a decline within this range

☐ 99–100% - very high level of certainty, data is accurate within this range

SECTION F ARE YOU AWARE OF TRENDS IN THE TOTAL RANGE OF THE SPECIES/SUBSPECIES? (If no, skip to section G)

Past Distribution/range/extent of occurrence, area of occupancy

18. Do you consider that the way the historic distribution has been estimated is appropriate? Please provide justification for your response.

19. Can you provide estimates (or if you disagree with the estimates provided, alternative estimates) of the former extent of occurrence and/or area of occupancy.

    If, because of uncertainty, you are unable to provide an estimate of past extent of occurrence, you may wish to provide an estimated range. If so, please choose one of the ranges suggested in the table below of ranges of past extent of occurrence, and also choose the level of confidence you have in this estimated range.

Past extent of occurrence is estimated to be in the range of:

☐ <100 km^2 ☐ 100 – 5 000 km^2 ☐ 5 001 – 20 000 km^2 ☐ >20 000 km^2

Level of your confidence in this estimated extent of occurrence

☐ 0–30% - low level of certainty/ a bit of a guess/ not much data to go on

☐ 31–50% - more than a guess, some level of supporting evidence

☐ 51–95% - reasonably certain, data suggests this range of decline

☐ 95–100% - high level of certainty, data indicates a decline within this range

☐ 99–100% - very high level of certainty, data is accurate within this range

If, because of uncertainty, you are unable to provide an estimate of past area of occupancy, you may wish to provide an estimated range. If so, please choose one of the ranges suggested in the table below of ranges of past area of occupancy, and also choose the level of confidence you have in this estimated range:

Past area of occupancy is estimated to be in the range of:

☐ <10 km^2 ☐ 11 – 500 km^2 ☐ 501 – 2000 km^2 ☐ >2000 km^2

Level of your confidence in this estimated extent of occurrence:

☐ 0–30% - low level of certainty/ a bit of a guess/ not much data to go on

☐ 31–50% - more than a guess, some level of supporting evidence

☐ 51–95% - reasonably certain, data suggests this range of decline

☐ 95–100% -high level of certainty, data indicates a decline within this range

☐ 99–100% - very high level of certainty, data is accurate within this range

PART 2 – INFORMATION FOR CONSERVATION ADVICE ON THREATS AND CONSERVATION ACTIONS

SECTION G DO YOU HAVE INFORMATION ON THREATS TO THE SURVIVAL OF THE SPECIES/SUBSPECIES? (If no, skip to section H)

20. Do you consider that all major threats have been identified and described adequately?

21. To what degree are the identified threats likely to impact on the species/subspecies in the future?

22. Are the threats impacting on different populations equally, or do the threats vary across different populations?

23. Can you provide additional or alternative information on past, current or potential threats that may adversely affect the species/subspecies at any stage of its life cycle?

24. Can you provide supporting data/justification or other information for your responses to these questions about threats?

SECTION H DO YOU HAVE INFORMATION ON CURRENT OR FUTURE MANAGEMENT FOR THE RECOVERY OF THE SPECIES/SUBSPECIES? (If no, skip to section I)

25. What planning, management and recovery actions are currently in place supporting protection and recovery of the species/subspecies? To what extent have they been effective?

26. Can you recommend any additional or alternative specific threat abatement or conservation actions that would aid the protection and recovery of the species/subspecies?

27. Would you recommend translocation (outside of the species' historic range) as a viable option as a conservation actions for this species/subspecies?

SECTION I DO YOU HAVE INFORMATION ON STAKEHOLDERS IN THE RECOVERY OF THE SPECIES/SUBSPECIES?

28. Are you aware of other knowledge (e.g. traditional ecological knowledge) or individuals/groups with knowledge that may help better understand population trends/fluctuations, or critical areas of habitat?

29. Are you aware of any cultural or social importance or use that the species/subspecies has?

30. What individuals or organisations are currently, or potentially could be, involved in management and recovery of the species/subspecies?

31. How aware of this species/subspecies are land managers where the species/subspecies is found?

32. What level of awareness is there with individuals or organisations around the issues affecting the species/subspecies?

    a. Where there is awareness, what are these interests of these individuals/organisations?

    b. Are there populations or areas of habitat that are particularly important to the community?

PART 3 – ANY OTHER INFORMATION

33. Do you have comments on any other matters relevant to the assessment of this species/subspecies?

Conservation Advice for *Caladenia tessellata* (thick-lipped spider-orchid)

This draft document is being released for consultation on the species listing eligibility and conservation actions

The purpose of this consultation document is to elicit additional information to better understand the status of the species and help inform conservation actions, further planning and a potential recovery plan. The draft assessment below should therefore be considered **tentative** at this stage, as it may change as a result of responses to this consultation process.

Note: Specific consultation questions relating to the below draft assessment and preliminary determination have been included in the consultation cover paper for your consideration.

This document combines the approved conservation advice and listing assessment for the species. It provides a foundation for conservation action and further planning.

Caladenia tessellata © Copyright, Tobias Hayashi

Conservation status

Caladenia tessellata (thick-lipped spider-orchid) is listed in the Vulnerable category of the threatened species list under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwth) (EPBC Act) effective from 16 July 2000. The species was eligible for listing because prior to the EPBC Act, it was listed as Vulnerable under the *Endangered Species Protection Act 1992* (Cwlth). There was no listing advice prepared for this species at that time.

Caladenia tessellata is proposed to remain in the Vulnerable category of the threatened species list under the EPBC Act.

Caladenia tessellata was assessed by the Threatened Species Scientific Committee to be eligible for listing as Vulnerable under criterion 3. The Committee's assessment is at Attachment A. The Committee assessment of the species' eligibility against each of the listing criteria is:

- Criterion 1: Insufficient data
- Criterion 2: Ineligible
- Criterion 3: C2a(i): Vulnerable
- Criterion 4: Ineligible
- Criterion 5: Insufficient data

The main factors that make the species eligible for listing in the Vulnerable category under Criterion 3 are that the number of mature individuals (estimated 1800–2500) is considered to be 'low' (<2500), there is an observed continuing decline due to the loss of some subpopulations, and the highest number of mature individuals in each subpopulation is 1000.

Species can also be listed as threatened under state and territory legislation. For information on the current listing status of this species under relevant state or territory legislation, see the Species Profile and Threat Database.

Species information

Taxonomy

Conventionally accepted as *Caladenia tessellata* Fitzg. (1876), belonging to *Caladenia* section Calonema (family Orchidaceae). Described from specimens collected at Hunters Hill, near Sydney. Similar species include *C. cardiochila* Tate (1887) which is found in Tasmania, South Australia and Victoria (west of Melbourne). There have been some suggestions that subpopulations of *C. tessellata* in Gippsland are similar to *C. cardiochila*, or that there is a gradual cline in variation from western Victoria to eastern Victoria/New South Wales (NSW). However, it is generally accepted that all plants east of Melbourne are *C. tessellata* (Duncan 2010; VicFlora 2015; Jones 2021).

Description

The thick-lipped spider-orchid 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. Like other orchids, the third petal is highly modified and known as the labellum. The labellum features 4 to 6 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 2 to 4 (or 6) rows extending almost to the apex (Duncan 2010, VicFlora 2015, Jones 2021, PlantNet 2021).

The thick-lipped spider-orchid is similar to the heart-lipped spider-orchid, *C. cardiochila*, from which it can be distinguished by the smaller flowers with toothed labellum margins and more congested labellum calli that usually extend almost to the labellum apex, although these features can be variable (Jones 2021).

Distribution

The thick-lipped spider-orchid is endemic to mainland south-eastern Australia, where it is distributed from the south coast of NSW to the eastern outskirts of Melbourne. See Map 1 for the modelled distribution of the species, Table 1 for a list of known subpopulations, and Table 2 for a list of known or likely extinct subpopulations. 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 two subpopulations at Morton National Park and near Braidwood, while a third subpopulation was recently discovered in Nadgee Nature Reserve near the border with Victoria (Bain 2021 pers. comm. 16 September). It was previously known to occur on the central coast near Swansea and Wyong, and on the south coast near Ulladulla (see Table 2), 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 (NSWSC 2008, Duncan 2010, Copeland 2021 pers. comm. 22 Sept). 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 (NSWSC 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). The species was previously known to occur at several additional subpopulations in Gippsland (see Table 2), but these may no longer be extant (Duncan 2010). The subpopulation near Genoa Falls has not been seen for over a decade and was likely destroyed by site disturbance (Backhouse 2021 pers. comm. 10 September).

Table 1 Known extant subpopulations of the thick-lipped spider-orchid

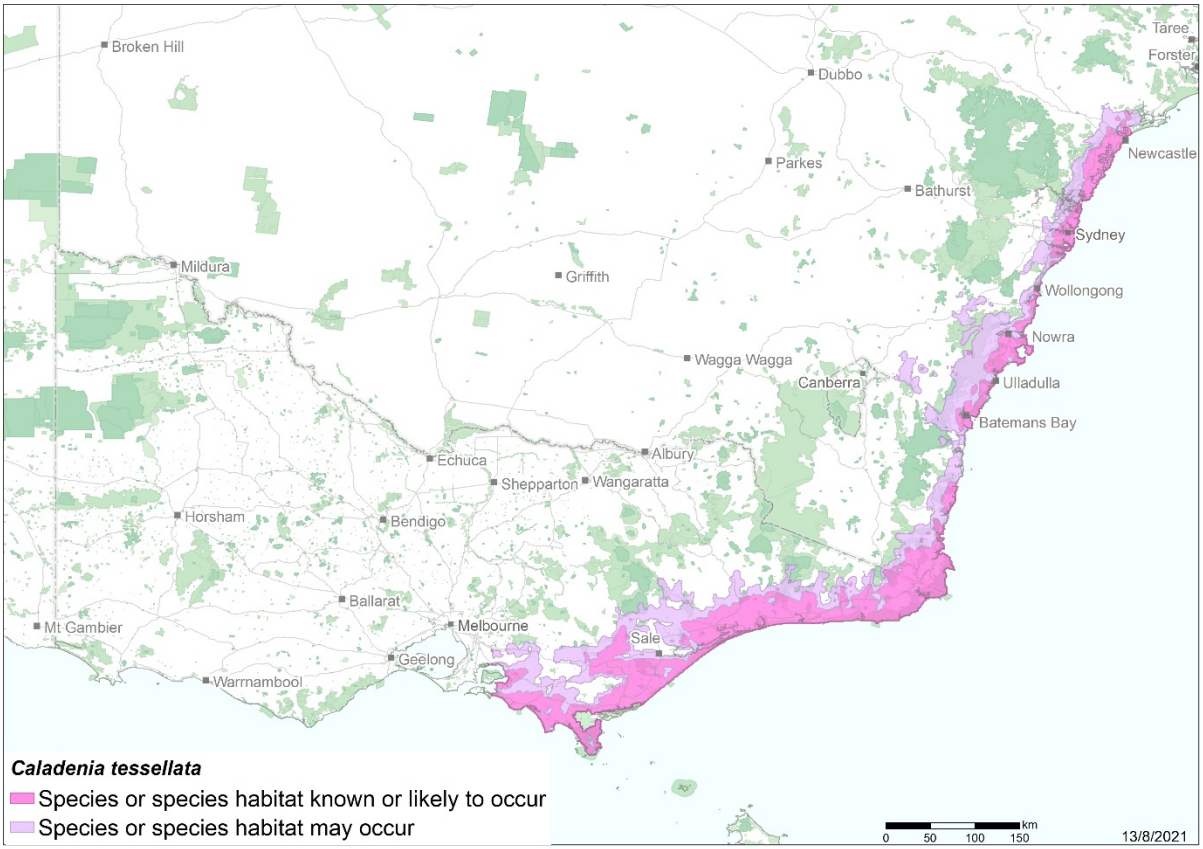
Subpopulation	Number of plants (year)	Area (ha)	Tenure	Notes
New South Wales				
Morton	1014 (2020)	2	Morton National Park	Burnt in 2019-20 fires (Phillips 2021 pers. comm. 17 September)
Braidwood	<10 (2021)	<1	Private property	

Nadgee	17 (2020)	?	Nadgee Nature Reserve	Discovered 2020 (Bain 2021 pers. comm. 16 September)
Victoria				
Mallacoota • Airport • Betka • Captains Creek • Shipwreck Creek	 73 (2020) 35 (1998) 2 (2011) 4 (2020)	 1 ? ? <0.1	 ? ? Croajingolong National Park Croajingolong National Park	Airport and Shipwreck Creek plants burnt in 2019-20 fires (Phillips 2021 pers. comm. 17 September)
Merremingger	143 (2020)	1	Merremingger State Forest	Partially burnt in 2019-20 fires (Phillips 2021 pers. comm. 17 September)
Wingan	7 (2020)	<1	Wingan State Forest	Burnt in 2019-20 fires (Phillips 2021 pers. comm. 17 September)
Cann Valley	207 (2020)	4	Cann Valley State Forest	Burnt in 2019-20 fires (Phillips 2021 pers. comm. 17 September)
Newmeralla	76 (2020)	3.5	Hartland State Forest, Ewings Morass Wildlife Reserve	Numerous groups south of Numeralla
Colquhoun	51 (2020)	25	Colquhoun State Forest	3 separate groups in Colquhoun plus two nearby groups at Lake Tyers Beach and Lake Tyers State Park
Moormurng	10 (2010)	<1	Moormurng Nature Conservation Reserve	
McLaughlin's Beach	<20	?	?	
Won Wron	30 (2010)	20	Won Wron State Forest	Scattered groups
Yarram	<10 (2010)	<5	?	
Port Albert	<10	?	?	
Nooramunga	<10 (2010)	<1	Nooramunga Multipurpose and Coastal Park	
Wilsons Promontory	100 (2010)	50	Wilsons Promontory National Park	
Wonthaggi Heathlands	40 (2010)	25	Wonthaggi Heathlands Nature Conservation Reserve	
Gurdies	30 (2010)	20	The Gurdies Nature Conservation Reserve	
Tarwin Lower	1 (2010)	<1	?	

Table 2 Uncertain or likely extinct subpopulations of the thick-lipped spider-orchid since 1960

Subpopulation	Number of plants	Notes
New South Wales		
Lake Macquarie State Conservation Area	1	Not seen since 2000
Munmorah State Conservation Area (Frazers Beach)	25-50	Not seen since 1998, despite regular searches by people who know the site (Copeland 2021 pers. comm. 22 September)
Norah Head	<10?	Not seen since 1996, despite regular searches by people who know the site (Copeland 2021 pers. comm. 22 September)
Warnervale	?	Population destroyed by development 1998
Heathcote	?	Population destroyed by development 1960s?
Budderoo Plateau	?	Not recorded since 2000
Huskisson, Jervis Bay	?	Population destroyed by development 1960s?
Ulladulla South Pacific Heathland Reserve	<10	Not seen since 1998, despite searches by people who know the site (Copeland 2021 pers. comm. 22 September)
Ulladulla Racecourse Crk	?	Population destroyed by development early 1990s
Victoria		
Genoa Falls	?	Not seen in over a decade; site likely destroyed by disturbance. (Backhouse 2021 pers. comm. 10 September)
Point Hicks	?	Herbarium record - 1970
Cape Conran	?	Herbarium record - 1980
Buchan	?	Two herbarium records both near Buchan 1980
Mt Raymond	?	Herbarium record - 1980
Marlo	?	Herbarium record - 1988
Gippsland Lakes / Golden Beach area	?	Herbarium records 1970s and 1980s
Mullungdung SF	?	Herbarium record - 1975

Map 1 Modelled distribution of thick-lipped spider-orchid



Source: Base map Geoscience Australia; species distribution data Species of National Environmental Significance database.
Caveat: The information presented in this map has been provided by a range of groups and agencies. While every effort has been made to ensure accuracy and completeness, no guarantee is given, nor responsibility taken by the Commonwealth for errors or omissions, and the Commonwealth does not accept responsibility in respect of any information or advice given in relation to, or as a consequence of, anything containing herein.
Species distribution mapping: The species distribution mapping categories are indicative only and aim to capture (a) the specific habitat type or geographic feature that represents to recent observed locations of the species (known to occur) or preferred habitat occurring in close proximity to these locations (likely to occur); and (b) the broad environmental envelope or geographic region that encompasses all areas that could provide habitat for the species (may occur). These presence categories are created using an extensive database of species observations records, national and regional-scale environmental data, environmental modelling techniques and documented scientific research.

Cultural and community significance

This section describes some published examples of this significance but is not intended to be comprehensive, applicable to, or speak for, all Indigenous Australians. Such knowledge may be only held by Indigenous groups and individuals who are the custodians of this knowledge.

Indigenous Australians have a long history of management of country on which the thick-lipped spider-orchid occurs. In NSW, the species occurs or previously occurred across numerous Local Aboriginal Land Councils, including Ulladulla (Morton National Park and Ulladulla subpopulations), Batemans Bay (Braidwood subpopulation), Darkinjung (Norah Head, Munmorah, Warnervale subpopulations), Tharawal (Heathcote subpopulation), Jerrinja (Jervis Bay subpopulation) and Eden (Nadgee subpopulation) Local Aboriginal Land Councils (NSW Aboriginal Land Council 2021). In Victoria, the species occurs on the lands of the Gunikurnai and Bunorong Peoples (Gippsland and south Melbourne subpopulations), while Traditional Owners

have not been formally recognised for the East Gippsland and Wilsons Promontory subpopulations (Aboriginal Victoria 2021). Little is known of the specific cultural significance of the thick-lipped spider-orchid, but in general, orchids including spider-orchids are culturally significant plants for Indigenous Australians, with their tubers used as a food source (Australian National Botanic Gardens 2007).

Relevant biology and ecology

Reproductive ecology:

The thick-lipped spider-orchid flowers in September and October. Like most other spider-orchids, it is sexually deceptive and pollinated by male thynnine wasps (Hymenoptera, Thynnidae) (Phillips et al. 2009). Sexually deceptive flowers produce chemical compounds which mimic the sex pheromones of female wasps, thereby attracting the males to flowers. Once at the flower, the male wasp grasps the labellum calli, mistaking it for a female, and attempts to mate or fly away with it, during which pollination is achieved. The likely pollinator of the thick-lipped spider-orchid is a *Phymatothynnus* species allied to *P. nitidus*, however further research is needed to confirm this (Phillips et al. 2009). Due to the highly specific nature of the sex pheromone attraction, the thick-lipped spider-orchid is likely to be pollinated by males of only one species of wasp. Sexually deceptive spider-orchids typically have only one species of pollinator (Phillips et al. 2017). Like other spider-orchids, the thick-lipped spider-orchid is reliant on the activity of pollinators for pollination and seed set (Phillips 2021 pers. comm. 17 September 2021).

Sexually deceptive orchids tend to have low rates of fruit set which are typically pollinator-limited. The average fruit set rate in Australian sexually deceptive spider-orchids is 14 percent (Phillips et al. 2009) while the average for sexually deceptive orchids globally is 20.5 percent (Gaskett 2011). In 2020, fruit set rate measured across 14 East Gippsland subpopulations of the thick-lipped spider-orchid revealed an average fruit set rate of 22.5 ± 5.9 percent (Phillips 2021 pers. comm. 17 September). This is adequate for ongoing recruitment in sexually deceptive orchids, however it is not known whether this is representative of typical fruit set levels in other years, or of fruit set across the species range. Although final fruit set rates were not captured at the Morton National Park subpopulation in 2020, indicators of pollinator activity (i.e. pollen removal and pollen deposition) measured toward the end of the flowering period were low (11.6 percent pollen removal and/or deposition, only 4.1 percent pollen deposition) (Phillips 2021 pers. comm. 17 September). The distribution, abundance, response to fire and ecological requirements of thynnine wasps are poorly known and lack of pollination represents a risk in managing the long-term recruitment of the species.

Following pollination, the ovary swells and seeds are released approximately five weeks later. Each capsule contains hundreds to thousands of minute seed which are wind dispersed. Little is known about the average dispersal distance of orchid seed. The majority of seed falls close to the parent plant (Jersakova & Malinova 2007), although genetic analysis of two species of terrestrial orchid in Europe indicated regular long distance gene flow over tens (but not hundreds) of kilometres (Kotilinek et al. 2020).

Spider-orchids typically reproduce from seed (Backhouse & Jeanes 1995), or occasionally via vegetative propagation (Dixon & 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 & Tremblay 2009). The long-term persistence of suitable mycorrhizal fungi is critical for ongoing recruitment although little is known of the ecological requirements for long-term maintenance of the mycorrhizal fungus in soil. Adult plants may promote localised enrichment of suitable mycorrhizal fungi (Batty et al. 2001).

No data are available regarding generation length or plant longevity for the thick-lipped spider-orchid. In general, generation length and longevity of most spider-orchids and other terrestrial orchids are not known but there are examples of individuals of *C. orientalis* having survived for at least 17 years in the wild (Carr 1999) and at least 20 years in cultivation (Faaste et al. 2011), while *C. huegelii* has been observed surviving in the wild for 25+ years (Swarts et al. 2009). The average life expectancy across a range of terrestrial orchids from the seedling stage is 16.3 ± 5.5 years (Shefferson et al. 2020).

Habitat ecology:

The thick-lipped spider-orchid 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. In Victoria the thick-lipped spider-orchid grows in heathland, heathy or grassy woodland, and grassy or sedgy open forests in well drained sand and clay loams (Duncan 2010).

Fire ecology:

The influence of fire on the life history of the thick-lipped spider-orchid is not well documented, although flowering is likely promoted by summer fires (Jones 2021). Approximately 100 flowering plants were known at the Morton National Park site as at 2019 (Coutts-McClelland 2021 pers. comm. 17 Sept) but over 1000 flowering individuals were counted in September 2020 following the 2019-20 bushfires which burnt the area (Phillips 2021 pers. comm. 17 September). Although flowering is 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 & 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 & Jeanes 1995). The timing of fire for orchids is important, with the most ecologically appropriate time to burn being summer or early autumn, during the dormant period after seed dispersal but prior to leaf emergence (Jasinge et al. 2018). All *Caladenia* deploy a unique mycorrhizal system where a stem collar at the soil surface subtends the leaf and is the primary source of mycorrhizal interaction with the surface soil organic matter. High frequency fire may be deleterious to the long-term survival of the species as it reduces the amount of organic matter in the upper soil layers (Dixon & Tremblay 2009).

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).

Habitat critical to the survival

Habitat for the thick-lipped spider-orchid is heathland on sandy soil, or grassy woodland with a heathy or sedgy understorey on well-drained sandy or clay loam. The species is widespread and

found in a range of habitats, but subpopulations are also disjunct and little is known of the precise habitat requirements of the species.

There is currently insufficient information available to describe (including their geographical locations) areas of habitat that are critical to the survival of the species. Further research is needed to do this (see Conservation actions). Until such information is available, all habitat for this species in all known extant and historical subpopulations should be considered important for the species' long-term survival.

No Critical Habitat as defined under section 207A of the EPBC Act has been identified or included in the Register of Critical Habitat.

Important populations

In this section, the word population is used to refer to subpopulation, in keeping with the terminology used in the EPBC Act and state/territory legislation.

There is sufficient evidence through the species eligibility for listing, to declare all populations/the national population as important populations of this species under particular pressure of survival and which therefore require protection to support the recovery of the species.

Threats

The thick-lipped spider-orchid is threatened by habitat destruction and degradation, inappropriate fire regimes, grazing and trampling by invasive and native herbivores and increased frequency of droughts due to climate change.

Lack of pollination is included as a threat due to the highly specialised pollination system, although there is insufficient evidence to determine if the species currently suffers from a lack of pollination. Given that the species likely relies on only a single species of pollinator, it is highly vulnerable to changes in pollinator abundance or shifts in the time of year that the pollinator emerges (pollinator flight date). It is possible that climate change may cause asynchrony between flowering date and pollinator flight date, as has been observed in the sexually deceptive European orchid *Ophrys sphegodes* and its male solitary bee pollinator (Robbirt et al. 2014). In addition, aseasonal fires that may occur during non-dormant times in the wasp's life cycle could impact wasp abundance. More research is needed to understand abundance and ecological requirements of the thynnine wasp that pollinates the thick-lipped spider-orchid.

Low genetic diversity is included as a threat, as many subpopulations are small (12 of the 19 extant subpopulations comprise <50 individuals and only four subpopulations comprise >100 individuals). Small subpopulations can experience reduced fitness due to inbreeding depression and are more likely to go extinct (Frankham et al. 2014). Effective subpopulation sizes (N_e) of >50 or >100 are commonly considered thresholds to avoid short-term impacts of low genetic diversity (note that N_e is usually much lower than the number of individuals in a subpopulation) (Frankham et al. 2014).

Feral pigs have been noted as a potential threat for plants at the Braidwood subpopulation (Duncan 2010), however the erection of a fence has successfully excluded feral pigs (McClelland 2021 pers. com. 17 September) and as such they are not included as a threat in Table 3.

Table 3 Threats impacting thick-lipped spider-orchid

Threat	Status and severity [a]	Evidence
Habitat loss, disturbance and fragmentation		
Road and track maintenance	• Status: current, future • Confidence: suspected • Consequence: major • Trend: static • Extent: across the entire range	Disturbance to, or destruction of, plants and habitat is the major risk faced by most subpopulations (Duncan 2010). There is a potential for road and track maintenance activities and fire protection works (e.g. construction of fire breaks) to damage trackside plants at the Moormurng, Tarwin Lower, Wonthaggi Heathlands and Wilsons Promontory sites. The subpopulation at the South Pacific Heathland Reserve at Ulladulla (NSW) may have been impacted by roadworks in 2010 (Duncan 2010). Accidental site disturbance caused by road maintenance activities may have contributed to the decline of this species at the Genoa site (Duncan 2010).
Trampling and recreational activities	• Status: current, future • Confidence: observed • Consequence: moderate • Trend: static • Extent: across the entire range	Trampling and site disturbance were known as serious problems at the Gurdies site in 2010 (Duncan 2010). Most plants occur close to tracksides and are at risk from walkers and track maintenance/fire protection activities. Accidental trampling and site disturbance are problems at the Wilsons Promontory, Colquhoun, Moormurng and Won Wron sites, as plants occur close to vehicle and walking tracks (Duncan 2010). Recreational activities such as accidental trampling by people, bicycles, dogs, and rubbish dumping are threats at the Colquhoun State Forrest site and Wonthaggi Heathlands Nature Conservation Reserve (Duncan 2010). Damage by recreational vehicles is a threat at the Morton National Park subpopulation, although this may be ameliorated by the recent construction of a road barrier near the site (Coutts-McClelland 2021 pers. comm. 17 September)
Inappropriate fire regimes	• Status: current, future • Confidence: suspected • Consequence: major • Trend: unknown • Extent: across the entire range	It is highly likely that some subpopulations of the thick-lipped spider-orchid, especially those growing in heath or heathy woodland, require periodic summer fire to reduce surrounding vegetation and stimulate flowering and seedling establishment (Duncan 2010). The prolonged absence of fire (or other biomass reduction process such as mowing) may be detrimental as it reduces flowering and thus the ability of the subpopulations to sustain themselves, leading to declines and extinction. On the other hand, high fire frequency may impact the mycorrhizal fungi required for seed germination (Dixon & Tremblay 2009). The timing of fire is also important, with the best time for orchids being late summer or early autumn, after seed dispersal but prior to new shoot growth (Jasinge et al. 2018). Fuel reduction burning of forests in spring

Threat	Status and severity [a]	Evidence
		and late autumn is a threatening process for many orchid species (Duncan 2010).
Urban Development	• Status: historical • Confidence: observed • Consequence: catastrophic • Trend: unknown • Extent: NSW	Urban development is the cause of historic decline and subpopulation destruction around Sydney, Jervis Bay and Ulladulla (NSWSC 2008, Duncan 2010). In 2021, extant subpopulations are not directly threatened by development, although its possible that some Victorian subpopulations close to towns (e.g. Mallacoota, Port Albert, Paradise Beach) may become threatened from development in the future.
Invasive species		
Grazing and trampling by invasive species	• Status: current, future • Confidence: observed • Consequence: moderate • Trend: unknown • Extent: across the entire range	Grazing and trampling by deer is a threat for subpopulations in South Gippsland (Duncan 2010) and Nadgee Nature Reserve (Bain 2021 pers. comm. 16 September). Grazing by rabbits has been noted as a threat for Moormurng and Braidwood sites (Duncan 2010).
Ecological interactions		
Grazing by macropods	• Status: current, future • Confidence: observed • Consequence: moderate • Trend: unknown • Extent: across the entire range	In 2010 grazing by macropods was noted as an existing or potential threat at almost all sites (Duncan 2010). Grazing by macropods, where they occur at high densities, can change the composition and abundance of vegetation (EPSD 2017). Rates of herbivory were relatively low (1% of inflorescences) across 14 East Gippsland subpopulations in 2020 (Phillips 2021 pers. comm. 17 September), however herbivory pressures are likely to vary year to year and it is not clear whether this is representative of other years or subpopulations. Herbivory, likely by invertebrates, has also been observed to damage flowers at the Morton NP subpopulation, although it is unclear how widespread this is (Coutts-McClelland pers. comm. 30 November)
Lack of natural pollination	• Status: future • Confidence: suspected • Consequence: major • Trend: unknown • Extent: across its entire range	The thick-lipped spider-orchid has a specific pollination system that leaves it vulnerable to the decline or loss of its pollinator species. The orchid relies on pollinators to set seed and as such loss of pollinator would lead to no recruitment and population decline. The loss of specific pollinators is a known threat to other threatened sexually deceptive orchids (Reiter et al. 2017). Although fruit set data indicated that this species was adequately pollinated in East Gippsland in 2020, there was little pollinator activity observed at the Morton NP site in NSW in 2020 and there are no data for West Gippsland subpopulations (Phillips 2021 pers. comm. 17 September).
Genetic threats resulting from small and fragmented populations		

Threat	Status and severity [a]	Evidence
Low genetic diversity	• Status: current, future • Confidence: inferred • Consequence: moderate • Trend: static • Extent: across its entire range	Many subpopulations are small (12 of the 19 extant subpopulations comprise <50 individuals and only four subpopulations comprise >100 individuals). Small subpopulations can experience reduced fitness due to inbreeding depression and are more likely to go extinct (Frankham et al. 2014). Effective population sizes (N_e) of >50 or >100 are commonly considered thresholds to avoid short-term impacts of low genetic diversity (Frankham et al. 2014). N_e is usually much lower than the number of individuals in a subpopulation, therefore most of the subpopulations may be at threatened by low genetic diversity.
Climate change		
Increasing intensity and frequency of drought	• Timing: current, future • Confidence: inferred • Consequence: moderate • Trend: increasing • Extent: across its entire range	Climate projections for eastern Australia include more frequent and intense droughts (CSIRO & Bureau of Meteorology 2015). An increasing frequency of droughts may negatively affect terrestrial orchids through direct mortality of adult plants and reduced recruitment (Coates et al. 2006).

Timing—identify the temporal nature of the threat;
Confidence—identify the extent to which we have confidence about the impact of the threat on the species;
Consequence—identify the severity of the threat;
Trend—identify the extent to which it will continue to operate on the species;
Extent—identify its spatial content in terms of the range of the species.

Each threat has been described in Table 3 in terms of the extent that it is operating on the species. The risk matrix (Table 4) provides a visual depiction of the level of risk being imposed by a threat and supports the prioritisation of subsequent management and conservation actions. In preparing a risk matrix, several factors have been taken into consideration, they are: the life stage they affect; the duration of the impact; and the efficacy of current management regimes, assuming that management will continue to be applied appropriately. The risk matrix and ranking of threats has been developed in consultation with in-house expertise using available literature.

Table 4 Thick-lipped spider-orchid risk matrix

Likelihood	Consequences				
	Not significant	**Minor**	**Moderate**	**Major**	**Catastrophic**
Almost certain	Low risk	Moderate risk	Very high risk **Trampling and recreational activities**	Very high risk	Very high risk

Likelihood	Consequences				
	Not significant	**Minor**	**Moderate**	**Major**	**Catastrophic**
Likely	Low risk	Moderate risk	High risk **Increased intensity and frequency of drought** **Grazing and trampling by invasive species** **Grazing by macropods**	Very high risk **Road and track maintenance**	Very high risk
Possible	Low risk	Moderate risk	High risk **Low genetic diversity**	Very high risk **Lack of pollination** **Inappriate fire regimes**	Very high risk **Urban development**
Unlikely	Low risk	Low risk	Moderate risk	High risk	Very high risk
Unknown	Low risk	Low risk	Moderate risk	High risk	Very high risk

Categories for likelihood are defined as follows:

Almost certain – expected to occur every year

Likely – expected to occur at least once every five years

Possible – might occur at some time

Unlikely – such events are known to have occurred on a worldwide basis but only a few times

Unknown – currently unknown how often the incident will occur

Categories for consequences are defined as follows:

Not significant – no long-term effect on individuals or populations

Minor – individuals are adversely affected but no effect at population level

Moderate – population recovery stalls or reduces

Major – population decreases

Catastrophic – population extirpation/extinction

Priority actions have then been developed to manage the threat particularly where the risk was deemed to be 'very high' or 'high'. For those threats with an unknown or low risk outcome it may be more appropriate to identify further research or maintain a watching brief.

Conservation and recovery actions

Primary conservation outcome

By 2030, the population of the thick-lipped spider-orchid will have increased in abundance and viable populations are sustained in habitats in which key threats are managed effectively.

Conservation and management priorities

Habitat loss, disturbance and modifications

- Prevent habitat disturbance and physical damage from road and track maintenance for subpopulations that occur on road and track sides by mapping known occurrences and

providing this information to organisations undertaking the maintenance. Ensure that known subpopulations are identified and buffers are maintained around individuals.

- Ensure land managers, in particular local councils, are aware of the species' location and provide protection measures against key and potential threats, such as trampling and road/track maintenance.
- Ensure appropriate management of subpopulations in areas of high recreational use, including, where appropriate, fencing and/or signage to encourage users to keep to established tracks.
- Initiate the acquisition of privately-owned land that support subpopulations, for addition to the national reserve system.

Fire

- Develop and implement a fire management strategy in consultation with relevant authorities and land managers. The strategy should define fire control measures, including fire intensity, frequency and timing that would be optimal for the thick-lipped spider-orchid.
- Ensure that prescribed fires occur only within the habitat during the dormant phase of the thick-lipped spider-orchid life cycle, and that such fires are at an interval (noting that wildfires will also occur) that do not result in high fire frequencies that may be deleterious to the survival of the species.
- Fire management authorities and land management agencies should use suitable maps and install field markers to avoid damage to the thick-lipped spider-orchid.

Invasive species (including threats from grazing, trampling, predation)

- Manage deer populations to minimise the impacts of hog, fallow and sambar deer on thick-lipped spider-orchid.
- Manage rabbit populations to minimse their impacts on thick-lipped spider-orchid. Refer to the Threat abatement plan for competition and land degradation by rabbits (DoEE 2016) for advice on research, management and other actions needed to ensure the long-term maintenance of native species affected by rabbits.

Breeding, seed collection, propagation and other ex situ recovery action

- To manage the risk of losing genetic diversity, undertake hand pollinations to ensure genetically diverse seed collection, and undertake seed collection and mycorrhizal collection and isolation. Seed and mycorrhiza should be stored in appropriate institutions, such as the Australian Plantbank Mount Annan, Royal Botanic Gardens Sydney and Royal Botanic Gardens Victoria. Best practice seed and mycorrhiza storage guidelines and procedures should be adhered to, to maximise seed viability and germinability (see Plant Germplasm Conservation in Australia; Martyn Yenson et al. 2021). Seeds from all major natural subpopulations should be collected and stored.
- If natural seed set is continually low in some subpopulations (e.g. <5 %), hand pollinations may be undertaken to supplement natural seed set and ensure seed dispersal.
- If appropriate, undertake ex situ propagation and translocations in accordance with the Guidelines for the Translocation of Threatened Plants in Australia (Commander et al. 2018).

Translocations and reintroductions may be appropriate in NSW where the species has declined or become locally extinct in the north of its range.

Stakeholder engagement/community engagement

- Identify who the relevant stakeholders are including Traditional Owners, local people, private landowners, public land managers and the general public as this species has a wide distribution over multiple land tenures.
- Engage and involve Traditional Owners in conservation actions, including surveying for new subpopulations and management actions.
- Liase with the local community and government agencies to ensure that up-to-date population data and scientific knowledge inform the implementation of conservation actions for this species.
- Engage community groups (e.g. Australasian Native Orchid Society Victoria branch, Orchid Society of Canberra, local community groups) by encouraging participation in surveys or monitoring, as well as active involvement in translocation programs where translocation is appropriate.
- Inform managers of sites where there are known subpopulations, and consult with these groups regarding options for conservation management and protection of the species.

Survey and monitoring priorities

- Establish and maintain a monitoring program to:
  - determine trends in population size and distribution, mortality and timing of life history stages. Monitor flowering and non-flowering individuals, rates of fruit set, and new recruits into the population to determine the limiting steps in the orchid's life cycle and the effects of fire on each step,
  - determine the relative impact of different threats, in particular grazing by herbivores and lack of pollination,
  - monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary.
- Survey for further extant subpopulations in areas where the thick-lipped spider-orchid was previously known to occur. The survey should be timed to maximise the likelihood of encountering flowering plants (September–October) and, where possible, in the spring following a hot summer fire.

Information and research priorities

- Investigate the taxonomic status of the thick-lipped spider-orchid throughout its range, including whether there is a gradual cline between *C. cardiochila* west of Melbourne and *C. tessellata* east of Melbourne, and whether plants from NSW/far eastern Victoria are the same taxon. Studies of population genetics and pollinators may help to determine if there is potential gene flow between the two species. This is a research action of high priority that will inform all subsequent management and research actions.
- Identify fire regimes which have a negative effect on the thick-lipped spider-orchid, and investigate whether regular management burns or mowing at appropriate times may be beneficial for some subpopulations.

- Investigate the ecological requirements of the thick-lipped spider-orchid, including habitat requirements, what pollinators are required, habitat requirements of the pollinators, the response of pollinators to bushfires and other habitat modifications caused by herbivores.
- Map habitat critical to the survival of the species and identify any critical habitat on Commonwealth land.
- Investigate the potential of citizen science monitoring and/or survey programs, where they exist, for collecting data to fill knowledge gaps.

Recovery plan decision

A decision about whether there should be a Recovery Plan for this species has not yet been determined. The purpose of this consultation document is to elicit additional information to help inform this decision.

Links to relevant implementation documents

Thick Lip Spider Orchid - profile | NSW Environment, Energy and Science

Caladenia tessellata (a terrestrial orchid) - endangered species listing | NSW Environment, Energy and Science

Threat abatement plan for competition and land degradation by rabbits | Department of Agriculture, Water and the Environment

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The Threatened Species Scientific Committee finalised this assessment on DD Month Year.

Attachment A: Listing Assessment for *Caladenia tessellata*

Reason for assessment

The thick-lipped spider-orchid was listed as Vulnerable under the *Endangered Species Protection Act 1992* and transferred to the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) when it commenced in July 2000.

This assessment follows prioritisation of a nomination from the TSSC.

Assessment of eligibility for listing

This assessment uses the criteria set out in the EPBC Regulations. The thresholds used correspond with those in the IUCN Red List criteria except where noted in criterion 4, sub-criterion D2. The IUCN criteria are used by Australian jurisdictions to achieve consistent listing assessments through the Common Assessment Method (CAM).

Key assessment parameters

Table 5 includes the key assessment parameters used in the assessment of eligibility for listing against the criteria.

Table 5 Key assessment parameters

Metric	Estimate used in the assessment	Minimum plausible value	Maximum plausible value	Justification
Number of mature individuals	1800-2500	1800	>2500	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 that those subpopulations (Phillips 2021 pers. comm. 17 September). The species is widespread but occurrence is patchy, therefore it is possible that some subpopulations remain undiscovered. However, it is also a well-known species that occurs in areas regularly visited by enthusiasts (particularly around Sydney, central coast NSW and Victoria), and as such it is unlikely that large numbers of plants remain undiscovered.

Metric	Estimate used in the assessment	Minimum plausible value	Maximum plausible value	Justification
Trend	declining			While there are few regular surveys, the destruction of some subpopulations has likely led to a decline in total numbers. There are insufficient data to characterise trends in extant subpopulations. The increase in flowering plants counted in 2020 at the Morton National Park site and some Victorian sites reflects good flowering stimulated by fire and good rainfall, rather than a genuine population increase. The plants that flowered in 2020 would have been present in previous years but may have been dormant or non-flowering.
Generation time (years)	20–40 years	5	>40	The generation time of spider-orchids is not well understood, but it is likely to be above 10 years, as orchids are typically long lived. Shefferson et al. (2020) estimated that average life expectancy from the seedling stage across all terrestrial orchids was 16.3 ± 5.5 years, although a spider-orchid had the longest estimated life expectancy (*C. orientalis*, 522 years). Faast et al. (2010) observed a *C. rigida* lifespan of 20+ years in cultivation, and Carr (1999) observed a *C. orientalis* lifespan of 17+ years in the wild and Swarts et al. (2009) observed a *C. huegelii* lifespan of 25+ years in the wild. Although there is no direct estimate of generation length for spider-orchids or comparable terrestrial orchids, a 20–40 years (midpoint 30 years) generation length is used here as a plausible estimate given the long-lived nature of spider-orchids. The time to first flowering for many orchids in the wild is at least 4 years (Backhouse & Cameron 2005), therefore 5 years is considered the shortest plausible generation length.

Metric	Estimate used in the assessment	Minimum plausible value	Maximum plausible value	Justification
Extent of occurrence	70,000 – 80,000 km^2	<70,000 km^2	111,000 km^2	The EOO is estimated at 110,840 km^2 including the Ulladulla and central coast NSW subpopulations, and 75,726 km^2 not including these subpopulations. Given these subpopulations are likely extinct, and the status of several Victorian subpopulations is uncertain, an estimate of 70,000-80,000 km^2 is considered reasonable. The species is already known to be widespread across southern NSW and Victoria, making it unlikely there are undiscovered subpopulations outside this range that would extend the EOO substantially.
Trend	contracting			The apparent loss of subpopulations in the northern part of the species range (Ulladulla, central coast NSW) has decreased the EOO.
Area of Occupancy	150–200 km^2	<150 km^2	>200 km^2	The AOO is estimated at 200 km^2 for all subpopulations, and at 180 km^2 excluding the likely extinct Ulladulla and central coast NSW subpopulations. Given that there are a number of Victorian subpopulations which are only known from herbarium records predating 1990, the AOO may to be less than 180 km^2. On the other hand, given the wide distribution of this species, it is possible that there are additional undiscovered subpopulations of this species, highlighted by the recent discovery in Nadgee. Still, the species is familiar and recognisable when in flower, and it is unlikely that large numbers of subpopulations remain undiscovered. Therefore, an estimate of 150–200 km^2 is considered reasonable.
Trend	contracting			The destruction of subpopulations due to development, along with the apparent loss of some subpopulations, have resulted in a decrease in AOO.
Number of subpopulations	19	19	25+	The species is known to be extant in 19 subpopulations. The maximum plausible value includes the 6 additional subpopulations where the species has not been seen in recent years despite regular searches, but where the site has not been destroyed and it is possible that plants may persist. Given the large area of apparently suitable habitat, it is possible that additional subpopulations may exist.

Metric	Estimate used in the assessment	Minimum plausible value	Maximum plausible value	Justification
Trend	declining			The destruction of subpopulations due to development, along with the apparent loss of some subpopulations, have resulted in a decrease in the number of subpopulations.
Basis of assessment of subpopulation number	Most subpopulations occur at distances >5 km from the nearest subpopulation. Although orchid seed is capable of long-distance dispersal, the vast majority of seed falls in close proximity to the parent plant (Phillips et al. 2020), thus subpopulations separated by >5 km were considered separate subpopulations.			
No. locations	19	19	25+	Habitat disturbance and destruction due to road and track maintenance, recreational activities and deer are the major threats. As these occur at relatively small spatial scales, each subpopulation has been assessed as a separate location.
Trend	declining			The destruction of subpopulations due to development or track maintenance activities, along with the decline and possible extinction of some subpopulations, have resulted in a decrease in the number of locations.
Basis of assessment of location number	Habitat disturbance and destruction due to road and track maintenance, recreational activities and deer are the major threats. As these occur at relatively small spatial scales, each subpopulation has been assessed as a separate location.			
Fragmentation	Not considered severely fragmented across its range. The thresholds for consideration as severely fragmented are unclear, as orchid seed is wind-dispersed and therefore capable of long-distance dispersal, yet the vast majority of seed land close to the parent plant (Jersakova & Malinova 2007; Phillips et al. 2020). Recent research on terrestrial orchids in Europe has suggested that gene flow may be regular between populations across tens (but not hundreds) of kilometers (Kotilinek et al. 2020). Therefore, a distance of 50–100+ km was considered to be the upper limit at which the species may regularly disperse. Given the number of subpopulations in Gippsland and the large area of potentially suitable habitat, it therefore seems unlikely the species is suffering from severe fragmentation across its range. The two NSW subpopulations north of Eden can be considered isolated, as they occur large distances (50–200+ km) from other subpopulations.			
Fluctuations	Not subject to extreme fluctuations in EOO, AOO, number of subpopulations, locations or mature individuals. Plants are long-lived and although there are fluctuations in the number of flowering plants, plants can persist in a dormant or non-flowering state. The sudden increase in flowering plants from ~100 to ~1000 in the Morton National Park subpopulation represents a flush of flowering stimulated by fire and good rainfall, rather than a population increase or fluctuation.			

Criterion 1 Population size reduction

Reduction in total numbers (measured over the longer of 10 years or 3 generations) based on any of A1 to A4			
	Critically Endangered **Very severe reduction**	**Endangered** **Severe reduction**	**Vulnerable** **Substantial reduction**
A1	≥ 90%	≥ 70%	≥ 50%
A2, A3, A4	≥ 80%	≥ 50%	≥ 30%

A1 Population reduction observed, estimated, inferred or suspected in the past and the causes of the reduction are clearly reversible AND understood AND ceased.

A2 Population reduction observed, estimated, inferred or suspected in the past where the causes of the reduction may not have ceased OR may not be understood OR may not be reversible.

A3 Population reduction, projected or suspected to be met in the future (up to a maximum of 100 years) [(*a) cannot be used for A3*]

A4 An observed, estimated, inferred, projected or suspected population reduction where the time period must include both the past and the future (up to a max. of 100 years in future), and where the causes of reduction may not have ceased OR may not be understood OR may not be reversible.

Based on any of the following

(a) direct observation [except A3]
(b) an index of abundance appropriate to the taxon
(c) a decline in area of occupancy, extent of occurrence and/or quality of habitat
(d) actual or potential levels of exploitation
(e) the effects of introduced taxa, hybridization, pathogens, pollutants, competitors or parasites

Criterion 1 evidence

Insufficient data to determine eligibility

There are an estimated 1800-2500 mature individuals in 2020. There are no long term survey data, therefore it is not possible to directly estimate the rate of population reduction.

The species has undergone a decline in EOO and AOO due to subpopulation destruction and local extinction since 1931 (i.e. over 90 years, the midpoint of the estimate for three generations). Assuming the Ulladulla and central coast NSW subpopulations are extinct, EOO has declined by 31.7 percent and AOO has declined by at least 10 percent. In addition, the status of several Victorian subpopulations are uncertain (Table 3), and some of these are likely to also be extinct. These Victorian subpopulations are not on the edge of the species range, so are unlikely to affect EOO substantially, but would likely affect AOO.

Although the decline in EOO meets the threshold for substantial reduction under subcriterion A2, this is as a result of the likely extinction of several subpopulations at the edge of the species range and EOO is unlikely to be a good proxy for number of individuals. In contrast, decline in AOO does not meet the threshold, although the decline in AOO may be underestimated due to the uncertain status of some Victorian populations.

Therefore, the Committee considers that while there is evidence of ongoing population declines, the available evidence is insufficient to determine whether the species is eligible for listing in any category under this criterion. However, the purpose of this consultation document is to elicit

additional information to better understand the species' status. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

Criterion 2 Geographic distribution as indicators for either extent of occurrence AND/OR area of occupancy

		Critically Endangered Very restricted	Endangered Restricted	Vulnerable Limited
B1.	Extent of occurrence (EOO)	**< 100 km²**	**< 5,000 km²**	**< 20,000 km²**
B2.	Area of occupancy (AOO)	**< 10 km²**	**< 500 km²**	**< 2,000 km²**
AND at least 2 of the following 3 conditions:				
(a)	Severely fragmented OR Number of locations	**= 1**	**≤ 5**	**≤ 10**
(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			
(c)	Extreme fluctuations in any of: (i) extent of occurrence; (ii) area of occupancy; (iii) number of locations or subpopulations; (iv) number of mature individuals			

Criterion 2 evidence

Not eligible

The species's Extent of Occurrence (EOO) is estimated at 70,000–80,000 km², and the Area of Occupancy (AOO) is estimated at 150–200 km². Therefore, the thick-lipped spider-orchid has a restricted AOO but does not meet the threshold for a limited EOO.

A taxon can be considered severely fragmented if >50 percent of its total AOO is in habitat patches that are (1) smaller than would be required to support a viable population, and (2) separated from other habitat patches by a large distance, relative to its dispersive potential (IUCN 2019). More than half (12 out of 19) subpopulations consist of fewer than 50 individuals, which may be smaller than needed to support a viable population. The thresholds for separation by a large distance are unclear, as orchid seed is wind-dispersed and therefore capable of long-distance dispersal, yet the vast majority of seed land close to the parent plant (Jersakova & Malinova 2007, Phillips et al. 2020). In two European terrestrial orchids, gene flow from seed dispersa was found to be regular between subpopulations across tens (but not hundreds) of kilometers (Kotilinek et al. 2020). Therefore, considering 50–100 km as the distance beyond which dispersal may become unlikely, and given the number of subpopulations in Gippsland and the large area of potentially suitable habitat, it seems unlikely the species is suffering from severe fragmentation across its range. In addition, the number of locations was estimated to be 19, therefore the species does not meet the criteria for number of locations.

The species is not subject to extreme fluctuations in population size as plants are long-lived and capable of persisting in a dormant or non-flowering state. The fluctuations in the number of flowering plants due to fire or rainfall do not represent population fluctuations.

Therefore, the Committee considers that the geographic distribution (AOO) is restricted, however there is currently no evidence to suggest that there are threats operating that would make the species' geographic distribution precarious for its survival.

However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

Criterion 3 Population size and decline

	Critically Endangered Very low	Endangered Low	Vulnerable Limited
Estimated number of mature individuals	**< 250**	**< 2,500**	**< 10,000**
AND either (C1) or (C2) is true			
C1. An observed, estimated or projected continuing decline of at least (up to a max. of 100 years in future)	**Very high rate 25% in 3 years or 1 generation (whichever is longer)**	**High rate 20% in 5 years or 2 generation (whichever is longer)**	**Substantial rate 10% in 10 years or 3 generations (whichever is longer)**
C2. An observed, estimated, projected or inferred continuing decline AND its geographic distribution is precarious for its survival based on at least 1 of the following 3 conditions:			
(a) (i) Number of mature individuals in each subpopulation	**≤ 50**	**≤ 250**	**≤ 1,000**
(a) (ii) % of mature individuals in one subpopulation =	**90 – 100%**	**95 – 100%**	**100%**
(b) Extreme fluctuations in the number of mature individuals			

Criterion 3 evidence

Eligible under Criterion 3 C2a(i) **for listing as** Vulnerable

The total number of mature individuals of this species is low (estimated at 1800–2500 individuals). In addition, there is an inferred continuing decline and its geographic distribution is precarious based on the number of mature individuals in each subpopulation being ≤1000.

The number of individuals in the largest subpopulation (1014 individuals at Morton National Park) is considered close enough to the threshold to be included as equal to 1000. This is supported by the fact that all other subpopulations consist of <250 individuals. There is an

inferred continuing decline due to the destruction of some subpopulations (Warnervale, Heathcote, Huskisson, Ulladulla) and a lack of observations at some subpopulations despite regular searches, suggesting local extinction (see Table 3).

The Committee considers that the estimated total number of mature individuals of this species is low, with an observed continuing decline and the geographic distribution is precarious for the survival of the species because the number of mature individuals in each subpopulation is ≤1000. Therefore, the species appears to meet the relevant elements of Criterion 3 to make it eligible for listing as Vulnerable.

However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

Criterion 4 Number of mature individuals

	Critically Endangered Extremely low	Endangered Very Low	Vulnerable Low
D. Number of mature individuals	< 50	< 250	< 1,000
D2.[1] *Only applies to the Vulnerable category* Restricted area of occupancy or number of locations with a plausible future threat that could drive the species to critically endangered or Extinct in a very short time			D2. Typically: area of occupancy < 20 km² or number of locations ≤ 5

[1] The IUCN Red List Criterion D allows for species to be listed as Vulnerable under Criterion D2. The corresponding Criterion 4 in the EPBC Regulations does not currently include the provision for listing a species under D2. As such, a species cannot currently be listed under the EPBC Act under Criterion D2 only. However, assessments may include information relevant to D2. This information will not be considered by the Committee in making its recommendation of the species' eligibility for listing under the EPBC Act, but may assist other jurisdictions to adopt the assessment outcome under the *common assessment method*.

Criterion 4 evidence

Not eligible

The total number of mature individuals is 1800–2500 which is not considered low. The area of occupancy is greater than 20 km² and there are more than five locations. Therefore, the species has not met this required element of this criterion.

However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

Criterion 5 Quantitative analysis

	Critically Endangered Immediate future	Endangered Near future	Vulnerable Medium-term future
Indicating the probability of extinction in the wild to be:	≥ 50% in 10 years or 3 generations, whichever is longer (100 years max.)	≥ 20% in 20 years or 5 generations, whichever is longer (100 years max.)	≥ 10% in 100 years

Criterion 5 evidence

Insufficient data to determine eligibility

Population viability analysis has not been undertaken. Therefore, there is insufficient information to determine the eligibility of the species for listing in any category under this criterion.

However, the purpose of this consultation document is to elicit additional information to better understand the species' status. This conclusion should therefore be considered to be tentative at this stage, as it may be changed as a result of responses to this consultation process.

Adequacy of survey

The survey effort has been considered adequate and there is sufficient scientific evidence to support the assessment.

Cataloguing data

This publication (and any material sourced from it) should be attributed as: Department of Agriculture, Water and the Environment 2021, *Conservation advice for* Caladenia tessellata *(thick-lipped spider-orchid)*, Canberra. 

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