



FLORA AND FAUNA GUARANTEE - SCIENTIFIC ADVISORY COMMITTEE
FINAL RECOMMENDATION ON A NOMINATION FOR LISTING

FLORA & FAUNA
GUARANTEE

Plectorrhiza tridentata (Lindl.) Dockrill - Tangle Orchid

DOCID107-417469679-742

Date of receipt of nomination: 4 May 2020

Date of preliminary recommendation: 16 October 2020

Date of final recommendation: 7 July 2021

Validity: The nomination is for a valid item.

Prescribed Information: The prescribed information was provided.

Name of the Nominator is adequately provided.

Name of the Item is adequately provided.

The nominated taxon is accepted by the Scientific Advisory Committee (SAC) as a valid taxon because it has been formally described and is accepted as a valid taxon by the Royal Botanic Gardens (RBG) Victoria.

Current conservation status

Plectorrhiza tridentata has been classified in Victoria as 'rare' (DEPI 2014) and in Queensland as 'least concern' (QLD Government 2020).

Eligibility for listing as a taxon under the Flora and Fauna Guarantee Act 1988

The Scientific Advisory Committee has assessed the eligibility of this nomination based on its extinction risk within Victoria in accordance with Section 16C(4)(c) of the *Flora and Fauna Guarantee Act 1988* (the Act).

This nomination was made to the SAC on 4 May 2020 in accordance with the Act and Flora and Fauna Guarantee Regulations 2011 and was accepted as a nomination by the SAC on 13 May 2020.

Amendments to the Act came into operation on 1 June 2020 and the Flora and Fauna Guarantee Regulations 2011 have since been replaced by the Flora and Fauna Guarantee Regulations 2020.

The SAC is therefore required to consider this nomination in accordance with the Act as amended and the criteria for determining eligibility for listing prescribed in the Flora and Fauna Guarantee Regulations 2020. In its application of the relevant eligibility criteria, the SAC has, as required by the nationally adopted Common Assessment Method, had regard to the *IUCN Red List Categories and Criteria* (Version 3.1) and the Guidelines for Using the *IUCN Red List Categories and Criteria* (Version 14, 2019).

Species information

Description and Life History

Tangle Orchid *Plectorrhiza tridentata* is a pendent evergreen epiphyte, with 1 or rarely 2 or more branching shoots (Benson & McDougall 2005, Bishop 2000). Stems are 1–35 cm long. Leaves are narrow-elliptic to ovate or obovate to oblong, 3–10 cm long, 3.5–16 mm wide and green to purplish. Inflorescences are 1–12 cm long, 2–15-flowered, straight to gently curved, pendent to spreading; pedicel plus ovary c. 6 mm long. Flowers are weakly cupped and strongly fragrant (lemony). Sepals and lateral petals oblong-ovate, brown and green or dark and light green, c. 5mm long. Labellum white with green or brown markings; midlobe c. 1.5 mm long, triangular, acute; lateral lobes c. 2mm long, triangular; spur 2–3 mm long, curved (VicFlora 2021, NSW Flora Online 2021).

The main substrate this orchid has been recorded on is the outer branches of trees e.g. *Tristaniopsis laurina*, *Syzygium smithii*, *Backhousia myrtifolia* (Gowland et al. 2014) and rarely on rocks. Plants are often suspended by one or a few of the numerous, tangled, aerial roots. Like related orchids, the Tangle Orchid has wind-dispersed seeds and forms a symbiotic relationship with a *Rhizoctonia*-like fungus for germination and establishment (Gowland op cit.). The species has a degree of host specificity that is reflected, in part, by the relationship between the fungus and the tree (Gowland op cit.) and is pollinated by insects. Thus, the growth and distribution of *P. tridentata* is dependent on the co-existence of multiple organisms.

Generation Length

The longevity of orchids (as with many perennial plants) is difficult to estimate, as there is debate about whether a generation is from seed germination to seed production, or whether it takes into account the longevity of vegetative parts. Under the IUCN criteria, a knowledge of generation length (the median age at which the species reproduces) is required to assess the rate of decline in the species. A lack of information concerning mortality factors complicates the story. One 'best guess' is 10 years, but this is likely to be an underestimate (Backhouse & Cameron 2005). In an assessment under IUCN criteria (DELWP unpublished) generation length was estimated at 30 years (20–40 years). Time to first flowering for many orchids is >2 years in cultivation, and >4 years in the wild (Backhouse & Cameron 2005). Flowers of *P. tridentata* can be found from September to January (Ralley 2011). There are reports of individuals of *P. tridentata* growing c. 500 mm, and being at least 20 years old (Stephenson 2005). On the basis of these reports, the SAC has agreed to use a generation length of 30 years in its assessment.

Distribution

The species is endemic to eastern Australia and recorded from Queensland, New South Wales and Victoria (Benson & McDougall 2005, VicFlora 2021). Its occurrence in Victoria is at the southernmost extent of its distribution. Within Victoria, the Area of Occupancy has been calculated as 188 km² and its Extent of Occurrence has been calculated as 4610 km² (DELWP unpublished).

Until very recently, the Tangle Orchid was thought to be confined to east of the Snowy River (Jeanes & Backhouse 2006, VicFlora 2021), however in 2019 (before the 2020 East Gippsland fires) a small population was recorded on the west bank of the Snowy River (Trust for Nature 2020). There are previous records of populations of the species in certain national parks, viz. Croajingolong National Park in Warm Temperate Rainforest of the Howe Range (NRE 1996, SAC 1996). There are occurrences of Tangle Orchid outside the Howe Range (i.e. through the Gippsland Ranges towards the Snowy River).

The species is not often encountered (Jeanes & Backhouse 2006) and the Royal Botanic Gardens Victoria notes it as restricted but locally abundant in rainforest east of the Snowy River, commonly overhanging watercourses from branches of stream-side trees and shrubs (VicFlora 2021). There are just over 100 records of the species in the Victorian Biodiversity Atlas/Royal Botanic Gardens data/AVH and many of these records are populations isolated from one another in pockets of rainforest. It is understood that the species is common in cultivation (nursery-orchid trade), however illegal trade and take from the wild is undocumented. The IUCN definition of location is 'a geographically or ecologically distinct area in which a single threatening event can rapidly affect all individuals of the taxon present [to the point that the population cannot recover in that location]'. The Tangle Orchid appears to have a single threat-based location (i.e. all of its distribution is facing the same threat(s)) because of its requirement for Warm Temperate Rainforest Habitat.

Habitat

The Tangle Orchid grows on a variety of host trees in Warm Temperate Rainforest, often on the outermost limbs and, as indicated above, usually over water (Jeanes & Backhouse 2006). It is also sometimes recorded as a lithophyte (Vleck 2007). Within Victoria it has been recorded from the FFG Act listed community 'Warm Temperate Rainforest (Cool Temperate Overlap, Howe Range)' (SAC 1996) and is apparently confined to Warm Temperate Rainforest in Victoria (Bishop 2000).

Threats

Fire

Evergreen epiphytic and lithophytic orchid species that grow in trees or on exposed rock surfaces are aerial and therefore at risk of being burnt during an intense bushfire (Duncan 2012). Fire can be particularly damaging to epiphytic species. If a bushfire is sufficiently intense to reach the canopy, it can not only kill orchid plants, but potentially kill their host trees (Lilly Pilly and Kanooka). This is what occurred in Kinglake NP following the 2009 bushfires where a large proportion of the preferred host trees of a similar epiphytic orchid *Sarcochilus australis* were killed by the fire front (Duncan 2012). In some cases, these species are likely to recolonise by seed from nearby unburnt areas, but in other cases these species may require conservation intervention to assist in their recovery.

Some orchid workers, when discussing 1980's fire events and impacts on epiphytic orchids, have a different view. Adams & Lawson (1984) following the March 1983 fires note:

'Sarcophilus australis and Plectorhiza tridentata, which perished in great numbers, will probably regenerate by seed from plants in surviving pockets of rainforest. Pollinators also survived the fires and set a good crop of capsules on flowering plants of all five species.'

However, with the apparent increase in landscape-scale fire events there is concern that repeated bushfires will be especially damaging to epiphytic orchids. A recent report (DELWP 2020) demonstrates this issue in a discussion on the 2020 East Gippsland fires & rainforest impacts:

'Rainforest in Victoria develops in the long-term absence of severe disturbance such as fire, and there are significant areas of rainforest within the current fire extent. Almost 100% of each of the communities within East Gippsland are within the projected impact area.'

'In addition to the burnt extent, these sites are at high risk of the future indirect impacts of bushfire such as soil erosion, exposure and elevated levels of feral herbivore browsing.'

In January 2020 available data suggested that 100% of Howe Range was burnt and 80+% of Tangle Orchid habitat was estimated to have been within the burn area (DELWP 2020). Although the Tangle Orchid is not restricted to the Howe Range (i.e. it also occurs through the Gippsland Ranges towards the Snowy River), this was thought to be its area of greatest abundance, and its other habitats are thought to be equally susceptible to landscape-scale fire events. The extent and severity of the 2019-20 bushfires has recalibrated the size of the area that can potentially be considered one location under the IUCN definition of location (above). The occurrence of Tangle Orchids only within Warm Temperate Rainforest in East Gippsland provides evidence that the Tangle Orchid can be assessed as having a single threat-based location in relation to fire.

Deer herbivory

A number of workers have identified and described the impacts of feral and native herbivores on terrestrial orchids, which could also apply to epiphytic orchids. For example, Keith & Pellow (2005) make the following point:

'...second mechanism of deer impact on the viability of plant populations is through the reduction of fruit production, as the resulting decline in seed banks reduces the capacity for seedling recruitment. These effects are likely to be most significant in species such as terrestrial orchids and lilies, in which all reproductive material may be consumed in a single visit, and those species whose reproductive effort is largely limited to the post-fire period.'

Sambar deer *Cervus unicolor* are widespread in the east of Victoria (VBA 2021) and are known to threaten rainforest communities as well as certain rainforest flora (Peel et al. 2005, SAC 2007). It is likely Sambar deer feed on epiphytic orchids when encountered during foraging. The availability of Tangle Orchid host trees is also likely to be impacted by deer browsing on new recruits. Additionally, the impacts of Sambar deer have increased significantly in recent years, both in intensity and geographic extent (Davies et al. 2020). Given the widespread and increasing distribution of deer in Victoria, and their capacity to forage on orchids when encountered and browse host tree recruits, Tangle Orchid can be assessed as having a single threat-based location in relation to deer herbivory.

Climate change

Climate change due to global warming interacts with habitat loss and fragmentation, introduced and invasive species and human population growth, and many ecosystems are likely to undergo severe modification (De & Medhi 2014). The combination of higher temperatures and lower rainfall may make forests more susceptible to fire and may lead to extinction of local species (De & Medhi op cit.). Additionally, any changes to the high humidity levels and the shaded, warm and protected habitats that the Tangle Orchid requires are likely to affect their long-term survival. Tangle Orchid can be assessed as having a single threat-based location in relation to climate change as it is likely to affect Victorian Warm Temperate Rainforest.

Illegal take

'Collection of native orchids' is an FFG Act listed Potentially Threatening Process (SAC 1993). Tangle Orchids have been threatened by illicit collection for the nursery trade (Jeanes & Backhouse 2006) and possibly also the essential oil trade (see internet reference below). There is no evidence that this threat is reduced, nor is there evidence that the threat is ongoing.

Decision by the Scientific Advisory Committee

The eligibility of the nominated taxon (including the extinction risk and the category of threat that applies to the taxon) to be specified in the Threatened List must be determined in accordance with the eligibility criteria prescribed for the purposes of Division 2 of Part 3 of the Act.

The relevant eligibility criteria are prescribed in Schedule 1 of the Flora and Fauna Guarantee Regulations 2020, which provides that a taxon is at risk of extinction in a particular category of threat and is therefore eligible to be specified in the Threatened List in relation to that category if a primary criterion for that category is met. Where applicable, a primary criterion is met if any one of its sub-criteria is satisfied.

Primary criterion 3.1

As per the definition of 'critically endangered' in the Act, the taxon is assessed as being critically endangered in Victoria.

Critically Endangered, in relation to a taxon of flora or fauna, means that the taxon is facing an extremely high risk of extinction in the wild in the immediate future.

The taxon is assessed as being eligible for listing as Critically Endangered under Criterion 3.1 – sub-criterion 3.1.1.

The taxon was assessed as not eligible under Criteria 3.1.2, 3.1.3, 3.1.4 & 3.1.5.

Subcriterion 3.1.1

The taxon has undergone, is suspected to have undergone, or is likely to undergo in the immediate future, a very severe reduction in population size.

(3.1.1 is equivalent to IUCN Criterion A)

Evidence provided:

The Tangle Orchid is restricted to appropriate Warm Temperate Rainforest gully habitats of East Gippsland. This habitat is severely fragmented. The area in which it occurs has experienced severe landscape-scale bushfires which threaten the long-term viability of the Warm Temperate Rainforest community which contains Tangle Orchid in Victoria. Some populations of Tangle Orchid may now be extinct. The species is prone to the effects of human activity or stochastic events within a very short time period and an uncertain future, and thus at risk of local extinction. Key threats include fuel reduction burns or wildfires (that could harm the taxon by increasing mortality or inhibiting regeneration); climate change (that increases the frequency, occurrence or severity of fire) and browsing of herbivores; in particular, Sambar deer. A projected decline is likely to occur in the absence of any appropriate intervention. Local catastrophic events including frequent wildfires (both in scale and intensity) together with the current severe and prolonged regional drought conditions throughout East Gippsland could potentially lead to the local extinction of the species.

The species has most likely suffered severe population decline in the 2020 bushfires (which impacted at least 80% of its modelled habitat). Estimated past population decline is between 60-85% and future population declines are estimated to be approximately 80% (DELWP unpublished). Given the potential impact of climate change and potential increase in frequent wildfires (both in scale and intensity) together with severe and prolonged regional drought conditions, a potential future decline of up to 100% in Victoria is possible.

With reference to the IUCN criteria, the taxon meets the category of Critically Endangered under A2abc + A3c + A4ac.

Documentation

The published information provided to and sourced by the SAC has been assessed. To the best of their knowledge, the SAC believes that the data presented are not the subject of scientific dispute and the inferences drawn are reasonable and well supported.

Advertisement for public comment

In accordance with the requirements of Section 16D of the *Flora and Fauna Guarantee Act 1988*, the preliminary recommendation (PRR) was advertised for a period of at least 30 days. The preliminary recommendation was advertised in:

Victorian Government Gazette on 12 November 2020

DELWP website

Public submissions closed on 12 December 2020.

Final Recommendation by the Scientific Advisory Committee

The Scientific Advisory Committee concludes that the nominated item satisfies at least one criterion of the set of criteria prepared and maintained under Division 2 of Part 3 of the Act and stated in Schedule 1 of the Flora and Fauna Guarantee Regulations 2020.

On the evidence available the nominated item is eligible for listing as Critically Endangered in Victoria because Primary criterion 3.1 - sub-criteria 3.1.1 of the FFG Regulations 2020 has been satisfied.

The Scientific Advisory Committee therefore makes a final recommendation that the nominated taxon be supported for listing as Critically Endangered under the *Flora and Fauna Guarantee Act 1988*.

Endorsement by the Convenor of the Scientific Advisory Committee

Date



Dr Michelle T. Casanova
Convenor

7 July 2021

References

- Adams, P.B. & Lawson, S.D. (1984) The Effects of Bushfire on Victorian Epiphytic and Lithophytic Orchids. *The Orchadian* **7** (12) (June).
- Backhouse, G. & Cameron, D. (2005) Application of IUCN 2001 Red List Categories in Determining the Conservation Status of Native Orchids of Victoria, Australia. *Selbyana* **2**: 58–74.
- Benson, D. & McDougall, L. (2005) Ecology of Sydney plant species: Part 10 Monocotyledon families Lemnaceae to Zosteraceae. *Cunninghamia* **9**(1): 16–212 (68).
- Bishop, A. (2000) *Field Guide to the orchids of New South Wales and Victoria*. 2nd edition. Tangle Orchid, pp: 206–207. University of NSW Press, Sydney.
- Davies, C., Wright, W., Hogan, F.E. & Davies, H. (2020) Detectability and activity patterns of sambar deer (*Rusa unicolor*) in Baw Baw National Park, Victoria. *Australian Mammalogy* **42**: 312–320.
- De, L.C. & Medhi, R.P. (2014) Climate change and its impact on productivity of orchids. *International Journal of Scientific Research* **3**(10): 500–504.
- DELWP (unpublished) RAMAS assessment of Tangle Orchid, March 2020. Biodiversity Division Department of Land, Water, Environment and Planning, Victoria.
- DELWP (2020) *Victoria's Bushfire Emergency: Biodiversity Response & Recovery. Preliminary Report Version 1*. Biodiversity Division, Department of Environment, Land, Water & Planning, Melbourne.
- DEPI (2014) *Advisory List of Rare or Threatened Plants in Victoria – 2014*. Tangle Orchid, p. 36. Department of Environment & Primary Industries, East Melbourne, Victoria.
- Duncan, M. (2012) *Response of Orchids to Bushfire: Black Saturday Victoria 2009 – Natural values fire recovery program*. Department of Sustainability and Environment, Heidelberg, Victoria.
- Gowland, K.M., van der Merwe, M.M., Linde, C.C., Clements, M.A. & Nicotra A.B. (2014) The host bias of three epiphytic Aseridinae orchid species is reflected, but not explained, by mycorrhizal fungal associations. *American Journal of Botany* **100**: 764–777.
- Jeanes, J. & Backhouse, G. (2006) *Wild orchids of Victoria, Australia*. Tangle Orchid, p. 302. Aquatic Photographics, Seaford.
- Keith, D. & Pellow, B.J. (2005) Effects of Javan rusa deer (*Cervus timorensis*) on native plant species in the Jibbon-Bundeena Area, Royal National Park, New South Wales. *Linnean Society of New South Wales* **126**: 99–110.

- NRE (1996) *Croajingolong National Park Management Plan*. Appendix 2, p. 44. National Parks Service, Department of Natural Resources & Environment, Melbourne.
- Peel, B., Bilney, R.J. & Bilney, R.J. (2005) Observations of the ecological impacts of Sambar *Cervus unicolor* in East Gippsland, Australia, with reference to destruction of rainforest communities. *The Victorian Naturalist* **122**: 189–200.
- SAC (1993) 'Collection of native orchids' (Nomination no. **280**), Potentially Threatening Process. Flora and Fauna Guarantee Scientific Advisory Committee. Department of Natural Resources & Environment, Melbourne.
- SAC (1996) Final Recommendation on a nomination for listing: 'Warm Temperate Rainforest (Cool Temperate Overlap, Howe Range) Community' (Nomination no. **363**). Flora and Fauna Guarantee Act Scientific Advisory Committee. Department of Sustainability & Environment, Melbourne.
- SAC (2007) 'Reduction in biodiversity by Sambar (*Cervus unicolor*)' (Nomination no. **756**), Potentially Threatening Process. Flora and Fauna Guarantee Scientific Advisory Committee. Department of Sustainability & Environment, Melbourne.
- Vleck, K. (2007) A pilgrim's pleasure and pain! On the hunt for Victoria's non-terrestrials. *ASGAP Indigenous Orchid Study Group Newsletter* **59** (June 2007): 2–3.

Personal Communication

J. Dunn, Australian Native Orchid Society Victoria, Epiphytic Study Group .

Internet material

'BF oil fragrances' (Kuala Lumpur, Malaysia), Orchid Fragrance Oil - **Tangle orchid** Tangle Root *Plectorrhiza tridentata* – <https://shopee.com.my/amp/Orchid-Fragrance-Oil-Tangle-orchid-Tangle-Root-Plectorrhiza-tridentata-i.159631762.5011892253>

NSW Flora Online (2021)

<https://www.rbgsyd.nsw.gov.au/>

QLD Government (2020) <https://apps.des.qld.gov.au/species-search/details/?id=14320>

Ralley, B.M. (2011) <http://floragreatlakes.info/html/rfspecies/plectorrhiza.html>

Royal Botanic Gardens NSW & Domain Trust (2021) (image)

<https://plantnet.rbgsyd.nsw.gov.au/floraonline.htm>

Stephenson, A.W. (2005) <https://www.orchidconservationcoalition.org/hl/incidentaldamage.html>

Trust for Nature (2020) Media release 'Rare orchid faces fight to survive' (Trust for Nature website 12 March 2020)

<https://www.trustfornature.org.au/news/2020/rare-orchid-faces-fight-to-survive>

VBA (2021) Victorian Biodiversity Atlas <https://vba.dse.vic.gov.au/vba/#/>

VicFlora (2021) Online Victorian flora database. Royal Botanic Gardens, Melbourne.

<https://vicflora.rbgs.vic.gov.au/flora/taxon/0fd475c9-34b4-4890-beab-ca5da89d>