

Conservation Advice

Dipodium campanulatum

bell-flower hyacinth orchid

Taxonomy

Conventionally accepted as *Dipodium campanulatum* D.L. Jones (Jones, 1991).

Conservation status

Endangered: Criterion 2 B2(a) (b)(iii)(iv)(v), Criterion 3 (B)(a)(b)(iii)(iv)(v)

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

<http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl>

Reason for conservation assessment by the Threatened Species Scientific Committee

The advice follows assessment of information provided by a public nomination to list *Dipodium campanulatum*.

Description

Dipodium campanulatum (bell-flower hyacinth orchid) is a leafless orchid with a green to reddish stem of 40–70cm tall. Each plant produces 15 to 35 white bell shaped flowers that are 15–29mm in width and marked by large dark pink blotches and spots. The petals are incurved giving the flowers a bell-shaped appearance.

Distribution

In South Australia, the species is restricted to the south east of the state on an ancient shoreline extending parallel to 10–20 km from the Victorian border; from near Padthaway south to the Glenelg River and was once common around Naracoorte. It is also known from western Victoria (Bates, 2011).

The species is currently known from one locality in southwest Victoria near Apsley (VIC SAC, 2012) and 14 subpopulations in South Australia. Eight subpopulations occur in the vicinity of Naracoorte Township and surrounding Naracoorte Caves. Three subpopulations occur in Glenroy Conservation Park and one subpopulation occurs in Penola Conservation Park, Big Heath Conservation Park and another on private land northwest of the Stewart Range (DEWNR, 2012).

Relevant Biology/Ecology

The bell-flower hyacinth orchid emerges between October to November as a single fleshy green stem with no leaves. It is saprophytic (i.e. living on dead or decaying matter) and relies on an association with mycorrhizal fungi, which in turn has a symbiotic association with a host plant species that is found growing nearby (Jones, 2006).

The age of sexual maturity is not known but as the species is perennial is likely to be within one year of germination. The flowering period for the bell-flower hyacinth orchid is December to February (Bates, 2011). Each plant produces a spike of 15 to 35 bell shaped white flowers of 15–29 mm in width marked with red blotches and spots. Flowers are pollinated by native bees

and wasps (Jones, 2006). The pollinated flowers develop into a dehiscent fruit which splits open to release seeds that are dispersed by the wind (Bates, 2011). The plant then reverts to dormancy from late January to February as an underground fleshy tuber (Jones, 2006). Seed capsules may be produced and can be seen for several more months (NRSE, 2014)

The bell-flower hyacinth orchid is typically found on deep grey sands or limestone in stringybark (*Eucalyptus baxteri/arenacea*) woodland with an understorey of bracken fern (*Pteridium esculentum*), *Acacia* species (Bates, 2011), cranberry heath (*Astroloma humifusum*) and magenta storks bill (*Pelargonium rodneyanum*) (NRSE, 2014). It is also found in South Australian blue gum (*E. leucoxylon*) and pink gum (*E. fasciculosa*) association woodlands (Bates, 2011). These areas have wet winters and long dry mild summers (Croft et al., 1999).

Threats

Croft et al. (1999) note that in the south east of South Australia, stringybark woodland occurs at 19.1 percent of its pre-European settlement extent, and blue gum/pink gum woodland at 7.8 percent. Croft et al. (1999) note that for many vegetation types, most remaining remnants are along roadsides or scattered woodland in farmland.

While the practice of large-scale clearing of vegetation has largely ceased, small scale clearing may result in loss of habitat and fragmentation of existing habitat for *Dipodium campanulatum*. Other threats include the slashing and trampling of the bell-flower hyacinth orchid during the growing season and grazing pressures particularly on private agricultural land (Dickson, pers. comm., 2013). Other threats also include weeds such as perennial veldt-grass (*Ehrharta calycina*), bluebell creeper (*Billardiera heterophylla*) and bridal creeper (*Asparagus asparagoides*) which compete for resources and degrade habitats, roadwork and track maintenance (NRSE, 2014), as well as inappropriate fire regimes and illegal picking of flowers often by public that may be unaware of its threatened status (Dickson pers. comm. 2014).

Remaining populations of the bell-flower hyacinth orchid are small and highly fragmented (Dickson, pers. comm., 2013). Nine subpopulations contain less than ten individuals (Bickerton, pers. comm., 2013) and hence are highly vulnerable to random events (e.g., disease) as well as from the effects of inbreeding, grazing by domestic cattle, weed and feral animal invasion, and slashing. It is considered vulnerable in South Australia because of its small population size and the further decline of its already restricted habitat (NRSE, 2014). Numerous threats still operate on the largest populations of the species in and around Naracoorte township and Stoney Point (Naracoorte National Park), South Australia. These populations are under threat from weed invasion, herbicide drift, mowing, earthworks and track maintenance especially as the plants often occur on the side of walking and 4WD tracks (Dickson pers. comm. 2014).

How judged by the Committee in relation to the EPBC Act Criteria and Regulations

Criterion 1: Reduction in numbers (based on any of A1 – A4)

- A1. An observed, estimated, inferred or suspected population very severe $\geq 90\%$, severe $\geq 70\%$ substantial $\geq 50\%$ size reduction over the last 10 years or three generations, whichever is the longer, where the causes of the reduction are clearly reversible AND understood AND ceased, based on (and specifying) any of the following:
- (a) direct observation
 - (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.
- A2. An observed, estimated, inferred or suspected population very severe $\geq 80\%$, severe $\geq 50\%$ substantial $\geq 30\%$ size reduction over the last 10 years or three generations, whichever is the longer, where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1.

- A3. A population size reduction very severe $\geq 80\%$, severe $\geq 50\%$ substantial $\geq 30\%$, projected or suspected to be met within the next 10 years or three generations, whichever is the longer (up to a maximum of 100 years), based on (and specifying) any of (b) to (e) under A1.
- A4. An observed, estimated, inferred, projected or suspected population size reduction very severe $\geq 80\%$, severe $\geq 50\%$ substantial $\geq 30\%$ over any 10 year or three generation period, whichever is longer (up to a maximum of 100 years in the future), where the time period must include both the past and the future, and where the reduction or its causes may not have ceased OR may not be understood OR may not be reversible, based on (and specifying) any of (a) to (e) under A1.

Evidence

The generation length of the bell-flower hyacinth orchid is not known. The species is a perennial (i.e. the plant will grow back for several seasons from the same root stock). There is no information on the age of sexual maturity or life expectancy of the bell-flower hyacinth orchid.

Given the woodland habitats of the species have undergone decline to up to 7.8 percent of their former (pre-European settlement) extent, it is likely the species' current fragmented distribution within its range is, to some extent, a result of this historic habitat decline. This inferred decline, however, is not quantifiable and, as this habitat loss extends from European settlement, it is not within the species' past three generation lengths, it is not considered within this criterion.

Little is known of the past distribution of this species but it is thought to have once been common around Naracoorte (Bates, 2011). Herbarium records date from 1961, but only three records were made before 1986 (Bickerton, pers. comm., 2013). Bates (2011) notes that the species was already becoming rare by 1991 as a result of serious loss of habitat. One population near Naracoorte was recorded to be 73 individuals in the late 1990s and had declined to 40 individuals in 2007 (Bickerton pers. comm. 2014).

The species has been recorded in Victoria at locations other than near Apsley (e.g., near Portland at Lake Condah, Mt Napier, Mt Eccles) (VIC SAC, 2012). Should these specimens be attributed to *D. campanulatum*, they suggest that this species has undergone some decline in extent of occurrence and/or number of locations or subpopulations. Clarification on records may demonstrate decline over period of time relevant to this criterion. Further decline in area of occupancy, extent and/or abundance is possible, however this is unquantifiable. There is insufficient information on past population numbers to quantitatively determine the level of reduction.

Not applicable: The Committee considers there is currently insufficient information available to judge whether the species has undergone, is suspected to have undergone, or is likely to undergo a reduction in numbers.

Criterion 2:

Geographic distribution (based on either of B1 or B2)

B1. Extent of occurrence estimated to be very restricted $< 100 \text{ km}^2$, restricted $< 5000 \text{ km}^2$ or limited $< 20\,000 \text{ km}^2$

B2. Area of occupancy estimated to be very restricted $< 10 \text{ km}^2$, restricted $< 500 \text{ km}^2$ or limited $< 2000 \text{ km}^2$

AND

Geographic distribution is precarious for the survival of the species, (based on at least two of a–c)

- a. Severely fragmented or known to exist at a limited location.
- b. Continuing decline, observed, inferred or projected, in any of the following:
 - (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 the following:
- (i) extent of occurrence
 - (ii) area of occupancy
 - (iii) number of locations or subpopulations
 - (iv) number of mature individuals

Evidence

The species is currently known from one locality in southwest Victoria near Apsley (VIC SAC, 2012) and 14 subpopulations in South Australia. Eight subpopulations occur in the vicinity of Naracoorte Township and surrounding Naracoorte Caves. There have been extensive surveys on both private and public land in the Naracoorte Range over the past 5 years (Bickerton pers. comm. 2014). Three subpopulations occur in Glenroy Conservation Park and one subpopulation occurs in Penola Conservation Park, Big Heath Conservation Park and another on private land northwest of the Stewart Range (DEWNR, 2012).

The extent of occurrence of the bell-flower hyacinth orchid is estimated to be approximately 1150 km² spanning South Australian and Victoria (Bickerton, pers. comm., 2013). The Committee therefore considers the extent of occurrence to be restricted (B1).

The area of occupancy was calculated based on presence of known locality points in 2 km grids and yielded an estimate of 76 km² (DoE pers. comms. 2014), which is considered to be restricted (B2).

The geographic distribution is precarious for the species because (a and b):

(a) the subpopulations are severely fragmented and relatively isolated from each other. There are 15 subpopulations of this species, with only one subpopulation occurring in Victoria (VIC SAC, 2012). Subpopulations are separated by more than one km, where the likelihood of genetic exchange is low. Some subpopulations comprise two or more sites, where sites are less than one km apart, but are either found within distinct and separate blocks of vegetation, or located on separate properties or land tenures. With the exception of three subpopulations (at Glen Roy), all subpopulations are separated either by urban settlement or agricultural land or land with unsuitable habitat (Bickerton, pers. comm., 2013). The largest subpopulation has 72 mature individuals over five sites, and nine subpopulations have less than 10 mature individuals each (Bickerton, pers. comm., 2013).

(b) There is only one surviving subpopulation left in Victoria with approximately 50 mature individuals (VIC SAC, 2012). Nine of the 14 subpopulations have less than ten mature individuals with two of these subpopulations represented by a single mature individual (Bickerton, pers. comm., 2013). Many grow along fire tracks, walking trails, roadsides and public access areas (Bickerton, pers. comm., 2013). While there is no historical data on the extent and area of occupancy, Bates (2011) noted that the species was more common in the past but was already becoming rare when it was described in 1991, most likely due to clearing of vegetation. Although broad-scale clearing has ceased, threats still operate on the species and these isolated populations with low numbers of individuals are highly susceptible to threats that may result in loss of habitat and further fragmentation. Climate change also poses a threat to the species due to changes in rainfall and temperature, the effects on the species' pollinators and increased frequency of extreme events such as heat waves (Barman & Devadas 2013). A succession of heat waves is the most likely cause for the failure of all plants in the larger populations of South Australia to set seed in 2013 (Dickson pers. comm. 2014). A continuing projected decline may therefore be inferred.

Available data do not demonstrate, observe or infer extreme fluctuations in extent of occurrence, area of occupancy, number of locations or subpopulations, or number of mature individuals.

The Committee considers the geographic distribution of this species to be very restricted. Location data suggest that the species' geographic distribution may be considered precarious as a result of serious fragmentation together with continuing decline inferred and/or projected in extent of occurrence, area of occupancy, number of locations and/or subpopulations.

Eligible for listing as endangered: Criterion 2 B2(a) (b)(iii)(iv)(v) or Criterion 2 B1(a) (b)(iii)(iv)(v)

Criterion 3: The estimated total number of mature individuals is very low <250, low <2500 or limited <10 000; **and** either of (A) or (B) is true

- (A) evidence suggests that the number will continue to decline at a very high (25% in 3 years or 1 generation (up to 100 years), whichever is longer), high (20% in 5 years or 2 generations (up to 100 years), whichever is longer) or substantial (10% in 10 years or 3 generations years), whichever is longer (up to 100) rate; or
- (B) the number is likely to continue to decline and its geographic distribution is precarious for its survival (based on at least two of a – c):
- a. Severely fragmented or known to exist at a limited location.
 - b. Continuing decline, observed, inferred or projected, in any of the following:
 - (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 the following:
 - (i) extent of occurrence
 - (ii) area of occupancy
 - (iii) number of locations or subpopulations
 - (iv) number of mature individuals

Evidence

The total number of mature individuals is estimated to be 318 mature plants with approximately 268 mature plants recorded from 14 subpopulations in South Australia since 2008 (Bickerton, pers. comm., 2013) and one subpopulation of less than 50 mature individuals in Victoria (VIC SAC, 2012). The number of mature individuals is therefore low.

(A) There is a lack of data to estimate a rate of decline for this species. There is, however, some evidence that declines have occurred. One population in South Australia was recorded as 73 individuals in the late 1990s but only 40 individuals in 2007 (Dickson pers. comm. 2014)

(B) The number of mature individuals is considered likely to undergo future decline because threats such as small scale clearing, slashing and trampling, weeds and grazing pressure still operate on the species and some small subpopulations are additionally at risk from inbreeding and edge effects. Climate change may also pose a current and emerging risk to the species via changes to temperature and rainfall, effects on pollinators and increased frequency of extreme weather events such as heat waves (Barman & Devadas, 2013). Its geographic distribution is considered precarious for its survival based on (a) and (b) as outlined in Criterion 2.

Given the above, the Committee considers the total number of mature individuals to be low and that this number is likely to continue to decline because threats continue to operate on the

populations.

Eligible for listing as endangered: Criterion 3 (B)(a)(b)(iii)(iv)(v)

Criterion 4: Estimated total number of mature individuals:

- (a) Extremely low < 50
- (b) Very low < 250
- (c) Low < 1000

Evidence

The total number of mature individual plants is estimated to be 318 (Bickerton pers. comm., 2013) with less than 50 individuals in a single population known to occur in Victoria (VIC SAC, 2012). Population numbers are based on actual counts rather than inferred. Extensive surveys were conducted in South Australia in 2008-2009 and 2010-2013 and hence the estimated total number of mature adults is considered to be reasonably accurate (Bickerton pers. comm. 2014, Dickson pers. comm. 2014).

Given the above, the Committee considers the total number of mature individuals to be low.

Eligible for listing as vulnerable: Criterion 4 (c)

Criterion 5: Probability of extinction in the wild based on quantitative analysis is at least:

- (a) 50% in the immediate future, 10 years or three generations (whichever is longer); or
- (b) 20% in the near future, 20 year or five generations (whichever is longer); or
- (c) 10% in the medium-term future, within 100 years.

Evidence

Not applicable: population viability analysis has not been undertaken. There are no models or quantitative analyses to estimate the probability of extinction.

Public Consultation

The draft conservation advice was made available for public comment on the department's website between 7 May 2014 and 20 June 2014. Any comments received that are relevant to the survival of the species have been considered by the Committee.

Recovery Plan

A recovery plan is not recommended as the approved conservation advice for *Dipodium campanulatum* provides sufficient direction to implement priority actions and mitigate against key threats.

Recovery and Impact avoidance guidance

Primary Conservation Objectives

- Protect, maintain and enhance existing and potential habitat.
- Manage and abate threats from clearing, weeds and feral animals.
- Increase the size of existing subpopulations.
- Investigate options for linking, enhancing or establishing additional populations.
- Raise awareness of the bell-flower hyacinth orchid within the local community and with managers of private and public lands about appropriate management of known populations.
- Effectively administer the recovery effort.

Important populations

As the species appears to be eligible for listing as critically endangered, every occurrence of *Dipodium campanulatum* is important.

Important habitat for the survival of the species

Important habitats are known habitats of current occurrence of the species and potential occurrence of the species. The bell-flower hyacinth orchid is typically found on deep grey sands or limestone in stringybark (*Eucalyptus baxteri/arenacea*) woodland with an understorey of bracken fern (*Pteridium esculentum*), *Acacia* species (Bates, 2011), cranberry heath (*Astroloma humifusum*) and magenta storks bill (*Pelargonium rodneyanum*) (NRSE, 2014). It is also found in South Australian blue gum (*E. leucoxylon*) and pink gum (*E. fasciculosa*) association woodlands (Bates, 2011). These areas have wet winters and long dry mild summers (Croft et al., 1999).

Information required, research and monitoring priorities

- Research the reproductive biology (e.g. identify the age to maturity, fecundity etc.) of the species.
- Research the reproductive ecology, such as identifying the pollinator and the mycorrhizal fungi associated with the species.
- Undertake genetic analyses to assess the levels of genetic diversity within populations and assess the importance of each subpopulation for the conservation of the species.
- Research germplasm storage of *Dipodium campanulatum* and cryopreservation of its associated mycorrhizal fungi for ex situ conservation of the species.

Management actions required

- Monitor both established and new populations at regular time intervals to allow early detection of declines.
- Protect existing populations from clearing, slashing and agricultural practices, and livestock grazing.
- Manage invasion of weeds at sites.
- Establish new populations in suitable habitat.
- If subpopulations are genetically distinct, consider establishing insurance subpopulations that are good genetic representations of the subpopulations.
- Monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary.

Recommendations

- (i) The Committee recommends that the list referred to in section 178 of the EPBC Act be amended by **including** in the list in the endangered category:

Dipodium campanulatum

- (ii) The Committee recommends that there should not be a recovery plan for this species.

Threatened Species Scientific Committee

04/11/2014

References cited in the advice

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