

## Conservation Assessment of *Calochilus pulchellus*

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### ***Calochilus pulchellus* D.L. Jones (Pretty Beard Orchid) (Orchidaceae)**

Distribution: Endemic to NSW

Current EPBC Act Status: Not listed

Current NSW TSC Act Status: Endangered

Proposed listing on NSW BC Act and EPBC Act: Upgrade to Critically Endangered on NSW BC and list on EPBC as Critically Endangered.

### **Conservation Advice: *Calochilus pulchellus***

#### **Summary of Conservation Assessment**

*Calochilus pulchellus* was found to be eligible for listing as Critically Endangered under Criteria B1ab (iii)(iv)(v), C2a(i) and D.

The main reasons for this species being eligible are i) the species has a very highly restricted geographic range, the extent of occurrence (EOO) is between 8 - 85 km<sup>2</sup> and the area of occupancy (AOO) is 8-12 km<sup>2</sup>; ii) there is a very small population size, of up to 30 individuals but possibly only 12 mature individuals; iii) all populations contain less than 50 mature individuals; iv) continuing decline is occurring in the quality and extent of the habitat of this species, the number of populations and the number of individuals as a result of urban development and associated impact, native browsers, and trampling by recreational users; and iv) the species is considered to be severely fragmented with all remaining populations very small and potentially not viable in the long term.

#### **Description and Taxonomy**

Plantnet (accessed April 2020) describes *Calochilus pulchellus* D.L. Jones (Pretty Beard Orchid), (family Orchidaceae) as a "Glabrous terrestrial herb. Single upright sublinear leaf, sheathing the flowering stem briefly at the base; leaf fully developed at flowering time, longitudinally channelled, roughly trigonous in cross-section, 100–180 mm long, 4–8 mm wide, dark green with a dark red base. Flowering stem 200–300 mm tall, bearing 1–5 flowers on pedicels 6–12 mm long. Flowers 25–30 mm long by c. 20 mm wide, sepals and petals pale green or greenish yellow with darker reddish longitudinal striations, labellum hairs coppery red. Dorsal sepal triangular-ovate, 13–16 mm tall, 8–9 mm wide at base; lateral sepals subtriangular, 13–16 mm long, 5–6 mm wide at base; petals 8–9 mm long, 5–6 mm wide. Labellum flat, 28–30 mm long, 6–7 mm wide, basal few mm with short red calli (warts), remainder with coarse hairs to 6 mm long, labellum tip a tapering hairless tail 12–17 mm long; column with two small blackish sham 'eyes' adjacent to base of labellum, the eyes lacking a connecting ridge. Fruits have not yet been observed." "*Calochilus pulchellus* is very similar to *C. grandiflorus* (Benth.) Domin, but the latter has a shorter leaf (30-50 mm long), a taller flowering stem (300-600 mm tall), and larger flowers (35-45 mm long, 22-28 mm broad, labellum 35-40 mm long)."

#### **Distribution and Abundance**

The NSW Scientific Committee (2008) state that "*Calochilus pulchellus* is endemic to New South Wales. It is known from the Sydney Basin Bioregion (sensu Thackway and Cresswell 1995), where a total of 30 adult plants have been recorded in three sites over a range of 40 km on the South Coast of NSW, at altitudes from 20-560 m a.s.l. All currently known sites are within the Shoalhaven Local Government Area. At Vincentia (five to nine plants) the species grows in dense low wet heath in wet sand over

sandstone (Jones 2006a). In Booderee National Park (one plant recorded in 2004) it grows in a tall heathy association. In Morton National Park on the Little Forest Plateau (18 plants in 2004) it occurs in low heath among scattered clumps of emergent eucalypts and Banksia in shallow coarse white sand over sandstone (Jones 2006a), in a near-escarpment area subject to strong orographic precipitation. Occurrence in small widely separated colonies is not unusual in the genus.”

By 2017 the population size of *Calochilus pulchellus* was reported to be 30 individuals across 3 sites:

*Vincentia population*: 11 plants known.

The site is on private land near the shore of Jervis Bay at about 20 m altitude. It is about 5 km from the Booderee National Park site and about 38-40 km from Little Forest population (Morton NP) (A. Stephenson, pers. comm. 2017). This site is currently zoned E2, and is scheduled for transfer into the Jervis Bay National Park at a future date.

Estimates of population size have been made over several years. Originally 5 plants were observed (2006 and 2007) (A. Stephenson, pers. comm. 2017), but in 2008, all of these five individuals were cleared due to a residential development at the site. Four out of the five plants were relocated before the development but all failed to survive after 2-3 years. (J. Briggs and A. Stephenson, pers. comm. 2017). In addition, in 2008, more plants were located at the site. Since 2011, population estimates have remained between 4-9 plants in an environmental protection zone (9 in 2011, 2014, 2015, (7 in 2015/16, 8 in 2016/17, 4 in 2017/18), while in 2017-18, two new mature individuals were discovered at the site (outside the environmental protection zone). In 2014, one additional plant was found nearby on private property (although it was impacted by cattle grazing), and its current fate is unknown.

The site was last burnt in a wildfire was in 1997-1998 (data collected by Parks and Wildlife Group, Forest New South Wales and the Rural Fire Service).

*Booderee National Park population*: Summary - 1 individual

This population is at the southern margin of Jervis Bay, and the land is a national park managed by Parks Australia. In 2004, a single plant was reported in this population (A. Stephenson, pers. comm. 2017). Since 2008, there have been no reports on the status of this single individual (A. Stephenson, pers. comm. 2017), although it appeared to persist after some nearby development works that were undertaken in 2008.

The site was last burnt in 2003-2004 (data collected by Parks and Wildlife Group, Forest New South Wales and the Rural Fire Service).

*Little Forest Plateau population (Morton National Park)*: Summary – 0 to 18 individuals

This population is located on the coastal escarpment NW of Milton, within Morton National Park at 560 m altitude (A. Stephenson, pers. comm. 2017). In November 2004, there were 18 mature individuals reported by Mark Clements. In 2014 - 2016, as a part of the *Partnerships Protecting Shoalhaven Plants* project under *Saving Our Species* program, OEH undertook surveys during two consecutive years (in 2015 and 2016) and no orchids were found (K. Coutts-McClelland, pers. comm. 2017). Apparently, this species only flowers when there are suitable weather conditions and humidity or sufficient moisture in the soil may be an important factor (J. Briggs and A. Stephenson, pers. comm. 2017). The cause of any decline/fluctuations in plant numbers is unknown, however competition with adjacent vegetation may be playing a role (K. Coutts-McClelland, pers. comm. 2017); as well as recreational users (trampling), native browsers, and drainage (J. Briggs, pers. comm. 2017). In May 2017, an ecological burn was undertaken at this site to investigate to examine

whether the orchids were being outcompeted/shaded out by adjacent vegetation (K. Coutts-McClelland, pers. comm. 2017). Two post-fire surveys (in early and late November 2017) did not detect any individuals, although the lack of winter rains may have been a contributing factor (K. Coutts-McClelland, pers. comm. 2017).

NSW NPWS advised that the Little Forest Plateau area was burnt in 2003, and prior to that in 1994. The area to north of the known *C. pulchellus* site was burnt in 2009. This site was also burnt in the 2019/2020 fires.

### Ecology

The NSW Scientific Committee (2008) state that “The life cycle of *C. pulchellus* is typical for temperate zone members of the genus, with the leaf emerging from a subterranean tuber in mid-winter, and flowering occurring from late October to late November, with only one or two flowers open at a time and each flower lasting only 2-4 days. The plant dies back to tubers in later summer. The generation time and longevity of individual plants is unknown for this species. M. Clements (pers. comm. 2007) suggests that few plants survive the flowering effort more than once or twice. Over time the species is probably reliant on recruitment from seed rather than vegetative persistence. The flowering period is very short; the generic pattern (M Clements, pers. comm. 2007) is for the flowers to be receptive to scoliid wasp pollination on day one, after which the interior configuration of the flower changes to make it inaccessible to pollinators but still receptive to self-pollination. Flowering is likely to be promoted by fire (Jones 2006b, M. Clements, pers. comm. 2007).”

“The cryptic nature of the species, with a single leaf above ground for only a few months and a flowering stem lasting days or weeks, makes detection difficult. It is likely that additional scattered individuals and small colonies exist within the area of occurrence.”

The response to fire of *Calochilus pulchellus* is unknown. It is possible that it resprouts from a dormant tuber as a fire response, however, there is no direct evidence of this (J. Briggs, pers. comm. 2017). No plants were observed following the May 2017 ecological burn at Little Forest Plateau subpopulation, although drought persisted at that site (K. Coutts-McClelland, pers. comm. 2017). This site was burnt again in 2019/20, but any post-fire recovery has not been assessed due to COVID-19 restrictions.

There is no evidence of ongoing recruitment in the species. The life cycle of *C. pulchellus* follows the typical pattern of native deciduous terrestrial orchid species. Leaves emerge mid-year and plants flower late October to late November with one-two flowers open at one time. After flowering, plants die back to fleshy subterranean tubers. Little knowledge is available regarding generation length (A. Stephenson, pers. comm. 2017). There is no data on primary juvenile periods or plant longevity currently available for *Calochilus pulchellus* (J. Briggs and K. Coutts-McClelland, pers. comm. 2017).

### Threats

The NSW Scientific Committee (2008) state that “The Vincentia site is on private land and is scheduled for clearing for a housing development in the near future. This will result in a decline of between 20% and 30% in the number of known plants. The Little Forest Plateau site is within Morton National Park and is unlikely to face threats other than inappropriate fire frequencies and possibly climate change. The very small colony sizes render the species liable to stochastic effects. Given that tubers may be exhausted after flowering, fire frequency is likely to be a management issue at all sites.”

Since the Scientific Determination (2008) the main threats recorded have been:

All sites – A very small population size make the species vulnerable to stochastic effects.

Vincentia population:

- Browsing (stems and fruit and flowers) by native animals (wallabies, wombats), potentially inhibiting or reducing seed production (J. Briggs, pers. comm. 2017). The known (flowering)

individuals at this site were caged in 2015 and 2016 for the purposes of seed collection. The cages have remained in place since, limiting browser access (K. Coutts-McClelland, pers. comm. 2017).

- Urban development changing hydrology of the land where the species is found (A. Stephenson, pers. comm. 2017).
- The entire population occurs on private land. Although, this land is currently zoned E2, and is scheduled for transfer into the Jervis Bay National Park at a future date.
- The single plant known discovered in 2014 at an additional, nearby site (on private land) is threatened by grazing and a possible future development (a Motel) (A. Stephenson, pers. comm. 2017).
- *Phytophthora sp.* has been detected at the site (K. Coutts-McClelland, pers. comm. 2017), although the impact of this pathogen on the species or the habitat of the species is unknown.

Booderee National Park;

- This population is a single individual that has not been monitored in several years. Discussions with local staff indicate this orchid has not been observed for a long time (K. Coutts-McClelland, pers. comm. 2017).
- This population has been threatened by recreational users and native browsers.

Little Forest Plateau (Morton NP);

- Site is accessible by recreational users who may inadvertently trample on the plants. Other threats include native browsers, drainage and competition (J. Briggs, pers. comm. 2017).
- Inappropriate fire regime. Too frequent fire may impact on the ability of the species to persist. The site has been recently burnt in 2017 and 2019/2020.

### **Assessment against IUCN Red List criteria**

For this assessment it is considered that the survey of *Calochilus pulchellus* has been adequate and there is sufficient scientific evidence to support the listing outcome.

#### *Criterion A Population Size reduction*

**Assessment Outcome:** Data Deficient

**Justification:** The 2004 estimates of population size was around 30 mature individuals (Vincentia – 9, Booderee NP – 1, and Little Forest – 18). Current estimates are approximately 10 individuals. No individuals have been discovered after the 2017 fire at Morton National Park, and the site was burnt again in 2019/2020. Information about generation time is not available for *Calochilus pulchellus*. Currently, there is insufficient data to assess this species against this criterion.

#### *Criterion B Geographic range*

**Assessment Outcome:** Critically Endangered under Criterion B1ab(iii)(iv)(v)

**Justification:** The extent of occurrence (EOO) for the *Calochilus pulchellus*, based on a convex hull polygon fitted around all known records (as per IUCN 2019 guidelines), was estimated to be 85 km<sup>2</sup>. This estimate includes all three known populations. A species with less than 100km<sup>2</sup> of EOO qualifies for the Critically Endangered category for this criterion. The area of occupancy (AOO) was estimated

to be 12 km<sup>2</sup>, based on three 2 x 2 km grid cells as recommended by IUCN (2019) (again, including all three populations). If Little Forest Plateau is excluded (no plants found post-2017 fire), the AOO would be 8 km<sup>2</sup>. A species with less than 10 km<sup>2</sup> of AOO qualifies for the Critically Endangered category, while a species with an AOO of less than 500 km<sup>2</sup> qualifies for Endangered.

In addition to these thresholds, at least two of three other conditions must be met. These conditions are:

- a) The population or habitat is observed or inferred to be severely fragmented or there is 1 (CR), ≤5 (EN) or ≤10 (VU) locations.

Assessment Outcome: sub criterion met at Critically Endangered threshold

Justification: Severe fragmentation: As per IUCN (2019), for *Calochilus pulchellus* there is likely to be increased extinction risks resulting from the fact that most of its individuals are found in small and relatively isolated populations. The 3 known populations are all very small (<10, 1, and 0-18 individuals) and may be smaller than needed to support a viable population. In addition, urban development has reduced potentially suitable habitat around the populations. The species is therefore considered to be severely fragmented.

Locations. There is likely to be three locations in this species. The major threat to the species is habitat loss and associated urban/recreational impacts. Each of the 3 populations represent different locations in relation to this threat. The other major threat is frequent fire, but only one site has experienced this recently (Morton National Park). A species with less than 5 locations qualifies for Endangered under this sub criterion.

- 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.

Assessment Outcome: sub criterion met for (iii) (iv) and (v).

Justification: Continuing decline is predicted in the following;

(iii) Extent of quality of habitat: the Vincentia population is on private land, and has been affected by clearing for residential/commercial development. While the area containing the known plants has been re-zoned to environmental protection, there remains a risk to this population until it is transferred to National Park estate. In Morton National Park on the Little Forest Plateau habitat is threatened by recreational users who may inadvertently trample on the plants or their habitat. Other threats include browsing by native herbivores, changed drainage patterns and adverse impacts of high fire frequency (the site has been burnt in both 2017 and 2019/20 and there was no observed recovery after the 2017 fire).

(iv) Number of locations or populations: The single plant at Booderee National Park is at risk of being lost through inadvertent recreational users. No plants were observed to recover after the 2017 fire at the Little Forest Plateau population at Morton NP (and the site has been burnt again in 2019/2020).

(v) Number of individuals: Mature individuals will be impacted by clearing, adverse grazing, trampling, changed drainage patterns and any adverse impacts of high fire frequency.

- c) Extreme fluctuations.

Assessment Outcome: data deficient

Justification: It is unknown if *Calochilus pulchellus* is a species that undergoes extreme fluctuations, but available data suggest this is unlikely.

*Criterion C Small population size and decline*

Assessment Outcome: Critically Endangered under Criterion C2a(i)

Justification: The total population size is currently estimated to be <10 up to 30 (if plants respond after the fire at Little Forest Plateau). A species with less than 250 mature individuals, would be considered to meet the threshold for Critically Endangered category.

At least one of two additional conditions must be met. These are:

- C1. An observed, estimated or projected continuing decline of at least: 25% in 3 years or 1 generations (whichever is longer) (CE); 20% in 5 years or 2 generations (whichever is longer) (EN); or 10% in 10 years or 3 generations (whichever is longer) (VU).

Assessment Outcome: data deficient.

Justification: Although the population may have declined from some 30 individuals in 2004 to around 10 in 2018, there is uncertainty around the persistence of plants at Little Forest Plateau, and the generation length of *Calochilus pulchellus* is unknown. Therefore, there is insufficient data to assess this species against this criterion.

- C2. An observed, estimated, projected or inferred continuing decline in number of mature individuals.

Assessment Outcome: sub criterion met.

Justification: Continuing decline is inferred in the following:

Number of individuals: Mature individuals will be impacted by clearing, adverse grazing, trampling, changed drainage patterns and any adverse impacts of high fire frequency.

In addition, at least 1 of the following 3 conditions:

- a (i). Number of mature individuals in each population  $\leq 50$  (CR);  $\leq 250$  (EN) or  $\leq 1000$  (VU).

Assessment Outcome: sub criterion met at Critically Endangered threshold.

Justification: The number of mature individuals in each population is less than 50.

- a (ii). % of mature individuals in one population is 90-100% (CR); 95-100% (EN) or 100% (VU).

Assessment Outcome: data deficient.

Justification: The most abundant subpopulation has been Little Forest Plateau at Morton NP. During the visits in 2015, 2016 and 2017, no orchids were found (K. Coutts-McClelland, pers. comm. 2017). At this stage, it is unclear whether this population has been completely lost. Therefore, there is insufficient information to assess this species against this sub criterion.

- b. Extreme fluctuations in the number of mature individuals.

Assessment Outcome: data deficient.

Justification: It is unknown if *Calochilus pulchellus* is a species that undergoes extreme fluctuations, but available data suggest this is unlikely.

#### *Criterion D Very small or restricted population*

Assessment Outcome: Critically Endangered under Criterion D

Justification: A species with less than 50 mature individuals, would be considered to meet the threshold for the Critically Endangered category. The total population size is currently estimated to be between 10 and 30 mature individuals.

#### *Criterion E Quantitative Analysis*

Assessment Outcome: Data Deficient

Justification: There is insufficient data available for *Calochilus pulchellus* to estimate the risk of extinction under this Criterion.

### **Conservation and Management Actions**

While there is no National Recovery Plan, the NSW Saving our Species (SOS) program has a site managed project for this species, including actions for each of Vincentia and Little Forest Plateau sites. The actions are being implemented as a part of the NSW Environmental Trust-SoS partnerships-funded Partnerships protecting Shoalhaven plants project.

#### Habitat loss, disturbance and modification

- Prevent impacts of recreational activities
- Protect individuals from browsing (including caging of individuals or fencing of habitat.
- Fence the environmental protection zone and convert the land into a reserve.

#### Ex situ conservation

- Develop a targeted seed collection program for ex situ seed banking.
- Maintain ex-situ collection for possible future translocations.

#### Stakeholder Management

- Inform land owners and managers of sites where there are known populations and consult with these groups regarding options for conservation management and protection of the species.
- Ensure land management is sympathetic to the long-term requirements of the species – negotiate land management agreements.
- Manage fire to prevent repeat fires of high frequency.

### **Survey and Monitoring priorities**

- Monitor for any increased habitat degradation.
- Regular annual surveys to determine population abundance and detect any recruitment, declines or fluctuations.
- Monitor for impacts of herbivory on standing plants each season.

### Information and Research priorities

- Investigate recruitment, seedling survival, tuber longevity.
- Investigate pollination and dependency of the species on certain pollinators.
- Investigate the impacts of fire on the species, the level of post-fire recovery and identify fire regimes that are detrimental and those that allow population persistence.
- Understand key requirements of the microhabitat of this species and any associated species-specific requirements (mycorrhiza, pollinators).
- Increase survey effort in an attempt to locate additional populations.

### References

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### Expert Communications

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