Threatened Species Assessment

Prasophyllum litorale
Coastal Leek-orchid

Taxonomy

Prasophyllum litorale R.J. Bates Family: Orchidaceae

Current conservation status

Listed as threatened under the *Flora and Fauna Guarantee Act 1988*.

Categorised as Vulnerable in the 2014 Advisory list of rare or threatened plants in Victoria (DEPI 2014).

Since the species is likely to be endemic to Victoria the Victorian regional assessment also represents a national assessment.

Proposed conservation status

Critically Endangered in Victoria and Australia

Qualifying Criteria CR C1+2a(i)

Species Information

Description and Life History

The species is a glabrous perennial herb arising annually from ovoid tubers. Flowering stem stout, 20-45 cm tall. Leaf-blade senescent at time of flowering, to c. 15 cm long, 5-9 mm diam. at base, apex lax. Flowers 15-40, variously coloured in greens and reds, fragrant, in a dense spike; ovary globose to obovoid, c. 5 mm long; sepals 6-9 mm long, dorsal sepal ovate-lanceolate, lateral sepals free, lanceolate, erect, parallel to slightly divergent, thick-textured, margins inrolled, apex often bidentate; petals 6-7 mm long, oblong, obtuse, often with pinkish crinkled margins. Labellum clawed, broadly trullate, 6-7 mm long, creamy-white to pink, recurved at right angles above middle, base pouched, recurved part triangular, with margins crenulate and crisped; callus plate green to brown, short, thick, warty, extending beyond bend, glistening with nectar. Column appendages oblong, 2-3 mm long, obtuse. The species flowers from December to January (VicFlora 2018).

Prasophyllum litorale is a distinctive species that can be recognised by its often tall, robust habit and variably coloured flowers with short, broad sepals and petals. The labellum is relatively short and broadly triangular with a deeply channelled glossy greenish callus plate with raised margins and extending only about two-thirds the distance to the apex. It also flowers in early summer when little else is in flower, decreasing the potential for misidentification (Backhouse *et al*. 2016).

In dense coastal heaths the species flowers mainly after fires, but in more open heaths and grasslands it flowers regularly every year. Fire is probably not a prerequisite for flowering but it may be required periodically to maintain the characteristics of coastal open heath. The species relies on good winter rainfall to stimulate reliable flowering(SAC 2001).

Generation Length

The generation length of the Coastal Leek-orchid is estimated to fall in the range of 20-35 years with a plausible median of 30 years. Generation length for non-colonial terrestrial orchids is estimated to be a nominal 30 years based on the annual replacement of the mother tuber by daughter tubers. Whilst somatically immortal, each individual is susceptible to endogenous exhaustion or environmental causes of mortality at rates likely to result in replacement at intervals of several decades only. Such orchids are classed as obligate seed regenerators (OSRs) reliant on seed-based recruitment for population maintenance. All *Prasophyllum* species propagate primarily from

seed, although several have been observed to develop into small clumps, presumably by vegetative means (Backhouse & Jeanes 1995). Clumping has not been reported in *P. littorale*.

Distribution

The species is likely to be endemic to Victoria. In South Australia, the species was last documented to occur in the far south-east of the state in 1995 and is now considered locally extinct in that state (Angela Duffy pers. comm.). The only South Australian record of the species is an Atlas of Living Australia (ALA) observation, apparently unsupported by any specimen in the Australasian Virtual Herbarium (AVH), taken in 1984 on private land in the Piccaninnie Ponds district. The identity of a purported specimen of the species collected by D. Ziegeler in 1992 at Ocean Beach on the central western coast of Tasmania requires further investigation but is suspected by at least some authorities to have been misidentified.

In Victoria, the species is confined to the coast in the far south-west between Portland and Nelson. The altitudinal range is 5-25 metres above sea level. At least eight subpopulations occur along almost 70 km of coast, mostly in the Discovery Bay Coastal Park.

The few known subpopulations are generally small, consisting of a few tens of plants, although there is a reasonable amount of suitable habitat within its distribution which is poorly accessible. Therefore, there may be more subpopulations than current records suggest.

Habitat

The species occurs in coastal scrub and heath on sandhills or headlands, in sand over moisture-retentive clays (VicFlora 2018). It typically grows in coastal heaths, grasslands and sedgy flats on the margins of dense, closed coastal scrubs. Substrates are usually well-drained, calcareous sand and sandy loam soils, often over limestone, that may be quite moist for part of the year (Backhouse & Jeanes 1995; SAC 2001).

Threats

A considerable amount of potential habitat near the coast between Portland and Nelson has been historically cleared for agricultural development and pine plantations, especially between Portland and Swan Lake, resulting in fragmentation of surviving subpopulations in these districts. The Dutton Way subpopulation, at the eastern limit of the species' range, has not been seen since 1991 and may have become recently extinct. The collection site is believed to have been private land and virtually no suitable habitat remains along this stretch of coast. In addition, this stretch of coastline is already subject to intense coastal retreat in response to refracted waves in the vicinity of Portland Harbour, a threat which is exacerbated by projected sea level rise.

Since the entire geographic range of the species is wedged between the ocean and cleared farmland, the habitat range of the species relies on water entering from the inland where, historically, swamps have been drained and water diverted to facilitate grazing. This has resulted in significant hydrological modification across the range of the species, resulting in drying of the substrate, inducing changes in vegetation structure and fire behaviour and facilitating invasion of drought tolerant shrubs such as *Acacia longifolia* subsp. *sophorae* (coast wattle) and *Leptospermum laevigatum* (coast tea-tree).

Long-term changes to coastal plant communities have occurred through damage and destruction by uncontrolled off-road vehicle use, especially dune buggies (Backhouse & Jeanes 1995) and motor bikes, as well as slashing, trampling from campers, and herbivory by rabbits and the introduced Mediterranean snail. Mowing at the campground at Swan Lake has also disturbed aboveground plant parts. These threats are ongoing despite most surviving stands of the coastal leek orchid being protected within the Discovery Bay Coastal Park.

Within the remaining habitat, broadscale changes to coastal plant communities from invasion by coast wattle represents a serious threat to the species (SAC 2001, Backhouse & Jeanes 1995). The introduced weed *Polygala myrtifolia* (myrtle-leaf milkwort) is also a potential threat (Backhouse & Jeanes 1995) as it has invaded considerable areas of the coast. The habitat of the species is further threatened by competition from the invasive Western Cape form of *Asparagus asparagoides* (Western Cape bridal creeper).

Changes to fire ecology of coastal heaths may also threaten the species, especially where heaths become too dense and remain unburnt for many years (Backhouse & Jeanes 1995). Aboveground plant parts at a site near

Portland have not been seen for over 10 years, and in the absence of fire the heath has changed from low open heath to tall dense heath dominated by wattles.

Climatic drying increases the risk of adult mortality and recruitment failure in response to prolonged and intense drought stress. Subpopulations at low elevations, such as Bridgewater Lakes and possibly also Swan Lake, are further threatened by coastal instability and sea level rise resulting in coastal erosion and infiltration of salt water into freshwater water tables.

IUCN Criteria

Standard of scientific evidence and adequacy of survey

For this assessment is it considered that the survey of the species has been adequate and there is sufficient scientific evidence to support estimates of population size, decline, EoO, AoO, subpopulation number and, therefore, the listing outcome. The species is restricted to a district with a long history of observation by field naturalists and botanical collectors, most notably Cliff Beauglehole who lived for many years at Gorae West and later at Portland, both within the geographic range of the species, resulting in 67 site records of the species in the Victorian Biodiversity Atlas (VBA) and 33 specimen records in the Australasian Virtual Herbarium (AVH), most of which are recent, reliably determined and locationally accurate.

Criterion A. Population size reduction.
Population reduction (measured over the longer of 10 years or 3 generations) based on any of A1 to A4

	Critically Endangered	Endangered	Vulnerable
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

Evidence:

Eligible under Criterion A2ace as Vulnerable

An estimate of population reduction over the past 60 to 105 years of 25-55%, with a nominal mean of 35%, is based on (a), (c) and (e) above.

This estimate of past decline is based on the historic impact of the identified threats across the last three generations, including the following:

A considerable amount of potential habitat near the coast between Portland and Nelson has been historically cleared for agricultural development and pine plantations, especially between Portland and Swan Lake, resulting in fragmentation of surviving subpopulations in these districts. The Dutton Way subpopulation, at the eastern limit of the species' range, has not been seen since 1991 and may have become recently extinct. The collection site is believed to have been private land and virtually no suitable habitat remains along this stretch of coast.

Long-term changes to coastal plant communities have occurred through damage and destruction by uncontrolled off-road vehicle use, especially dune buggies and motor bikes, slashing, trampling from campers, and herbivory by rabbits and the introduced Mediterranean snail. Mowing at the campground at Swan Lake has also disturbed aboveground plant parts.

Broadscale changes to coastal plant communities have also resulted from invasion by coast wattle which represents a serious threat to the species (SAC 2001, Backhouse & Jeanes 1995). The introduced weed myrtle-leaf milkwort has also invaded considerable areas of the coast. Changes to the fire ecology of coastal heaths have also threatened the species, especially where heaths became too dense and remain unburnt for many years (Backhouse & Jeanes 1995). Plants at a site near Portland have not been seen for over 10 years, and in the absence of fire the heath has changed from low open heath to tall dense heath dominated by wattles.

Eligible under Criterion A3ce as Endangered

Population reduction over the next 60-100 years is projected to be 40-60%, with a nominal mean of 50%, based on (c) and (e) above. The causes of reduction have not ceased, are well understood and are not reversible.

This estimate of future decline is based on the projected impact of the identified threats including continuing disturbance from off-road vehicles (especially dune buggies and motorbikes), habitat change through the imposition of unfavourable anthropogenic fire regimes, the increasing threat of prolonged and intense drought stress through climatic drying and the continuing impact of habitat-transforming invasive exotic weeds including coast wattle, *P*myrtle-leaf milkwort) and tWestern Cape bridal creeper). Some subpopulations at low elevation are also threatened by sea level rise resulting in coastal erosion and salt water infiltration into freshwater water tables.

Eligible under Criterion A4ace as Endangered

Population reduction over any 60 to 105 year period, including both past and future (up to 100 years in the future), is estimated to be 40-60%, with a nominal mean of 50%, based on (a), (c) and (e) above. The causes of reduction have not ceased, are well understood and are not reversible.

Estimates of past and future decline are based on the past and projected impacts of the threats identified above.

Criterion B. Geographic range in the form of either B1 (extent of occurrence) and/or B2 (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			

Evidence:

Eligible under Criterion B1ab(i,ii,iii,iv,v) as Endangered

The Extent of Occurrence (EoO) across the species' range is estimated to be 463 km², based on accepted, post-1970 records from the Victorian Biodiversity Atlas (VBA). Historic, mislocated or locationally imprecise records are excluded from this assessment.

The species is estimated to be severely fragmented and is estimated to have a single location. It has a continuing decline in (i), (ii), (iii), (iv) and (v) above, based on the current and projected impact of the identified threats, many of which operate synergistically across the limited ecological and geographic range of the species irrespective of tenure and localised stochastic risks.

The species is severely fragmented, at least anthropogenically and plausibly, but less confidently, naturally, at the landscape scale with at least 8 small, isolated subpopulations along 70 km of coast that are all at risk from disturbance, anthropogenic fire regimes, weed invasion and drying conditions from reductions in rainfall, such that there is increased extinction risk and little or no probability of recolonisation should subpopulations become extinct. Although seed are numerous, small and light and easily wind-dispersed, most seed is caught in dense vegetation close to the parent plant where there is little opportunity for successful germination except following intense fire events which are likely to consume all the available seed pods. The prevailing westerly winds, which routinely buffet the coastline from Nelson to Portland, are consistently onshore with no upwind donors of wind-dispersed seed, further limiting the potential for recolonisation in the event of local extinction.

A single location is identified since the species is a habitat specialist which occupies a narrow band of coastal habitat all of which is subject to a consistent suite of prevailing and projected threats, namely habitat modification through the imposition of unfavourable anthropogenic fire regimes, invasion by aggressive exotic transformer weeds and the increasing threat of prolonged and extreme drought stress resulting from climatic drying. In addition, many sites are subject to anthropogenic disturbances such as off-road vehicles, especially dune buggies and motorbikes, despite the majority of extant occurrences now being protected within the Discovery Bay Coastal Park.

Eligible under Criterion B2ab(i,ii,iii,iv,v) as Endangered

The Area of Occupancy (AoO) across the species' range is estimated to be 64 km², based on 2 x 2 km grids derived from accepted, reliable, locationally accurate post-1970 records from the VBA.

The species is estimated to be severely fragmented and is estimated to have a single location. It has a continuing decline in (i), (ii), (iii), (iv) and (v) above, based on the current and projected impact of the identified threats, many

of which operate synergistically across the limited ecological and geographic range of the species irrespective of tenure and localised stochastic risks.

Criterion C. Small Population size and decline				
		Critically Endangered	Endangered	Vulnerable
Number of mature individuals		< 250	< 2,500	< 10,000
AND at least one of C1 or C2				
C1	An observed, estimated or projected continuing decline of at least (up to a max. of 100 years in future):	25% in 3 years or 1 generation (whichever is longer)	20% in 5 years or 2 generations (whichever is longer)	10% in 10 years or 3 generations (whichever is longer)
C2	An observed, estimated, projected or inferred continuing decline AND least 1 of the following 3 conditions:			
(a)	(i) Number of mature individuals in each subpopulation	≤ 50	≤ 250	≤ 1,000
	(ii) % of mature individuals in one subpopulation =	90 – 100%	95 – 100%	100%
(b) Extreme fluctuations in the number of mature individuals				

Evidence:

Eligible under Criterion C1+2a(i) as Critically Endangered

It is estimated that there are 40 to 220 (with a best estimate of 100) mature individuals and population size is projected to decline in the next 20-35 years by 15-30%, with a nominal mean estimate of 20-25% future decline. Estimates of population size provided by Gary Backhouse are supported by targeted surveys and incidental observations between 2008 and 2021, mostly taken by David Pitts and Karl Just in 2015 and 2021 at five widely distributed sites within Discovery Bay Coastal Park.

The species is estimated to be in continuing decline in population size based on the current and projected impact of the identified threats and no subpopulation is estimated to contain more than 50 mature individuals. Three subpopulations contain approximately 10-50 mature individuals: North-west Scenic Drive, Portland, Browns Road, Discovery Bay Coastal Park and Nelson, Discovery Bay Coastal Park.

Criterion D. Very small or restricted population			
	Critically Endangered	Endangered	Vulnerable
Number of mature individuals (observed or estimated)	< 50	< 250	< 1,000
D2 Only applies to the VU 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: AoO < 20 km2 or number of locations ≤ 5

Evidence:

Eligible under Criterion D as Endangered

Population size is estimated to comprise 40 to 220 mature individuals with a nominal median estimate of 100 mature individuals.

Criterion E (Quantitative Analysis) was not addressed as the species has not been subjected to a detailed Population Viability Analysis.

Primary conservation objective

To maintain Coastal Leek-orchid populations and population processes that allow ongoing recruitment success while managing threats effectively to ensure survival and retention of evolutionary development in the wild.

Conservation and management priorities

Habitat loss, disturbance and modifications impacts

- Identify populations of high conservation priority.
- Control access routes on public land to constrain public access at known sites.
- Implement measures to control actual and potential causes of physical anthropomorphic disturbance.
- Erect exclusion fencing around important sites to protect individuals from human disturbance and herbivore destruction.
- Investigate formal conservation arrangements, management agreements and covenants on private land, and for crown and private land investigate inclusion in reserve tenure if possible.

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

- Identify and remove weeds in the local area and manage sites to prevent introduction of invasive weeds that threaten or could become a threat to coastal leek-orchid, including *m*yrtle-leaf milkwort.
- Reduce rabbit population densities and maintain low levels through rabbit control programs.
- Implement and deliver invasive Mediterranean snail control program across occurrence sites.
- Provide information and support to landholders in areas with suitable habitat regarding the control and spread of weeds and invasive species.

Fire impacts

- Develop and implement a suitable fire management strategy for protecting coastal leek-orchid habitat that maintains an appropriate burning regime to reduce biomass and encourage reproduction. Ensure fire management strategy follows any available sound scientific evidence and related advice. Ecological burns should only occur when plants are dormant.
- Provide maps of known occurrences to local and state Country Fire Authority and seek inclusion of mitigative measures in bush fire risk management plans, risk register and/or operational response maps.

Impacts of native species

- Design and implement a plan to appropriately and carefully manage the invasion of coast wattle) to mitigate the risk of changing coastal leek-orchid habitat.

Ex situ recovery actions

- Undertake seed germination trials, including with symbiotic mycorrhizal partners, to enable the ex situ propagation of the species.

- Develop a targeted seed collection program for ex situ seed banking. Ensure to collect both seed and mycorrhizal fungi for storage and ex situ propagation, with period testing of seed viability through germination testing.Implement national translocation protocols if establishing additional populations is considered feasible.

Stakeholder engagement/community engagement

- Raise awareness of coastal leek-orchid and the importance of protecting its habitat in the local community, particularly in regard to populations in national parks.
- Inform and consult with landowners and managers of sites where there are known populations to mitigate the risk of unintentional damage to populations, such as non-target effects of weed control or inappropriate fire regimes and encourage these key stakeholders to contribute to the implementation of conservation management actions.

Survey and monitoring priorities

- More precisely assess population size, distribution, ecological requirements and the relative impacts of threatening processes.
- Undertake survey work in suitable habitat and potential habitat to locate any additional populations, particularly in remote and largely inaccessible parts of the south coast.
- Conduct post-burn monitoring to determine optimal fire regimes for promoting seed production and germination and provide further information on how coastal leek-orchid responds to fire over time.

Information and research priorities

- . Conduct investigations into the propagation and ex situ growing methods for the species. Undertake seed germination trials to determine the requirements for successful establishment; including with symbiotic mycorrhizal partners. Identify which mycorrhizal partners are required for germination of the species.
- Investigate options for linking, enhancing or establishing additional populations.
- Determine if there is gene flow between populations, and whether the species is suffering from any negative effects of small population size.
- Assess drought tolerance,susceptibility and interactive effects of multiple coinciding disturbances such as drought, fire,flooding and changes to groundwater quality through salt water intrusion.
- Investigate effective types of habitat management to assist in the survival of the species.
- Investigate the impacts of climate change on the long-term survival prospects of the species.
- Determine the optimum fire frequency for the coastal leek-orchid.

This list does not necessarily encompass all actions that may be of benefit to Coastal Leek-orchid but highlights those that are considered to be of highest priority at the time of preparing the conservation advice.

References

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