National Recovery Plan for Fifteen Threatened Orchids in South-eastern Australia

Pterostylis sp. aff. *mutica*

Pterostylis lustra

Caladenia cretacea

Paracaleana disjuncta

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This Recovery Plan has been developed with the involvement and cooperation of a range of stakeholders, but individual stakeholders have not necessarily committed to undertaking specific actions. The attainment of objectives and the provision of funds may be subject to budgetary and other constraints affecting the parties involved. Proposed actions may be subject to modification over the life of the plan due to changes in knowledge.

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Cover photograph: Grampians Duck Orchid *Paracaleana disjuncta*, by Gary Backhouse

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Summary

This Recovery Plan covers 15 species of small, deciduous terrestrial orchids endemic to mainland south-eastern Australia (Table 1). Eleven species are endemic to Victoria, while four species (*Caladenia ornata*, *Corybas* sp. aff. *diemenicus*, *Paracaleana disjuncta* and *Pterostylis lustra*) occur in both Victoria and South Australia.

All 15 species are considered threatened (Table 2). Four species are known to have declined, eight species are known from few, scattered, generally small populations, while seven species are known from just a single population, with five of these comprising just 10 or fewer plants. All species have almost certainly suffered a decline in range and abundance through loss of habitat. Major threats to remaining populations include disturbance to or destruction of plants and habitat, weed invasion, and grazing by pest animals.

This national Recovery Plan for the 15 threatened orchids is the first recovery plan for these species, and details their distribution, habitat, threats and recovery objectives and actions necessary to ensure their long-term survival.

Table 1. List of threatened orchids covered in this Recovery Plan

Scientific name	Common name	Authority/Reference
Caladenia cretacea	Stuart Mill Spider-orchid	Jones (2006a)
Caladenia insularis	French Island Spider-orchid	Carr (1991); Backhouse & Jeanes (1995)
Caladenia ornata	Ornate Pink Fingers	Nicholls (1945, 1969); Backhouse & Jeanes (1995); Jones (2000)
Caladenia sp. aff. *fragrantissima* (Central Victoria)*	Bendigo Spider Orchid	Undescribed; see Bishop (1996); Jeanes & Backhouse (2006); Ross & Walsh (2003)
Caladenia sp. aff. *rosella* (Violet Town)*	Violet Town Spider-orchid	Undescribed; see Jeanes & Backhouse (2006) (as *Caladenia* sp. aff. *concolor* 2); Ross & Walsh (2003)
Corunastylis sp. aff. *nudiscapa* (Otway Ranges)*	Otways Midge-orchid	Undescribed; see Jeanes & Backhouse (2006); Ross & Walsh (2003)
Corybas sp. aff. *diemenicus* (Coastal)*	Late Helmet-orchid	Undescribed; see Backhouse & Jeanes (1995); Bishop (1996); Jeanes & Backhouse (2006); Ross & Walsh (2003)
Paracaleana disjuncta	Grampians Duck-orchid	Jones (2003)
Pterostylis cheraphila	Floodplain Rustyhood	Jones & Clements (1993); Backhouse & Jeanes (1995)
Pterostylis chlorogramma	Green-striped Greenhood	Jones & Clements (1993); Backhouse & Jeanes (1995)
Pterostylis lustra	Small Sickle Greenhood	Jones (2006a)
Pterostylis sp. aff. *bicolor* (Woorndoo)*	Dense Greenhood	Undescribed; see Jeanes & Backhouse (2006); Ross & Walsh (2003)
Pterostylis sp. aff. *cycnocephala* (Woorndoo)*	Cygnet Greenhood	Undescribed; see Jeanes & Backhouse (2006); Ross & Walsh (2003)
Pterostylis sp. aff. *dolichochila* (Portland)*	Portland Long-tongue Shell Orchid	Undescribed; see Bishop (1996); Jeanes & Backhouse (2006); Ross & Walsh (2003)
Pterostylis sp. aff. *mutica* (Basalt Plains)*	Leprechaun Greenhood	Undescribed, see Bishop (1996); Jeanes & Backhouse (2006); Ross & Walsh (2003)

* for the undescribed species, nomenclature follows *A Census of the Vascular Plants of Victoria* (Ross & Walsh 2003), published by the National Herbarium of Victoria (Royal Botanic Gardens, Melbourne).

Conservation Status

Four species (*Caladenia insularis*, *Caladenia ornata*, *Pterostylis cheraphila* and *Pterostylis chlorogramma*) are listed as Vulnerable under the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act; Table 2). All 15 species are listed as Threatened under the Victorian *Flora and Fauna Guarantee Act 1988* (FFG Act), while two species (*C. ornata* and *P. disjuncta*) are listed as Endangered under the South Australian *National Parks and Wildlife Act 1972* (NPW Act). For each threatened orchid not listed under the EPBC Act, a nomination form for listing has been submitted to the Threatened Species ScientificR'*%ommittee.

Table 2. Conservation status of the 15 threatened orchids

Species	National*	Victoria#	South Australia@
Caladenia cretacea	-	TH	-
Caladenia insularis	VU	TH	-
Caladenia ornata (note: this species is listed under the EPBC Act under its former name: *Caladenia carnea* var. *ornata*)	VU	TH	EN
Caladenia sp. aff. *fragrantissima* (Central Victoria)	-	TH	-
Caladenia sp. aff. *rosella* (Violet Town)	-	TH	-
Corunastylis sp. aff. *nudiscapa* (Otway Ranges)	-	TH	-
Corybas sp. aff. *diemenicus* (coastal)	-	TH	-
Paracaleana disjuncta	-	TH	EN
Pterostylis cheraphila	VU	TH	-
Pterostylis chlorogramma	VU	TH	-
Pterostylis lustra	-	TH	-
Pterostylis sp. aff. *bicolor* (Woorndoo)	-	TH	-
Pterostylis sp. aff. *cycnocephala* (Woorndoo)	-	TH	-
Pterostylis sp. aff. *dolichochila* (Portland)	-	TH	-
Pterostylis sp. aff. *mutica* (Basalt Plains)	-	TH	-

Abbreviations: EN = Endangered; VU = Vulnerable; TH = Threatened

* EPBC Act 1999; # FFG Act 1988; @ NPW Act 1972

Species Information

Caladenia cretacea D.L. Jones Stuart Mill Spider-orchid

Description

The Stuart Mill Spider-orchid *Caladenia cretacea* is a small terrestrial, deciduous herb that emerges annually from a spherical subterranean tuber. There is a single basal, lanceolate, reddish-green leaf to 60 mm long. The erect hairy flower stem grows to 25 cm tall and has a single (rarely two) large white flower with brownish labellum calli and marginal teeth. The sepals and petals are up to 70 mm long, slender, with filamentous tips covered with sparse reddish-brown glands; the dorsal sepal is erect, the petals and lateral sepals spreading and deflexed. The labellum is narrowly triangular, the tip rolled under, the margins with few, widely-spaced, short blunt teeth decreasing in size and extending almost to the apex, while the lamina has four rows of short, curved, bluntly pointed calli (description from Jones 2006a). Little is known of the ecology of *C. cretacea*. Plants have a summer dormancy, with growth occurring during late autumn, winter and spring, and the species flowers in September and October. Plants reproduce solely from seed. Pollinators and response to fire are not known.

Distribution

Caladenia cretacea is endemic to Victoria, where it is currently known from a single location near Stuart Mill in the Victorian Midlands IBRA bioregion (*sensu* DEH 2000) (Figure 1). Maps showing the distribution of *C. cretacea* are available from the Department of Sustainability and Environment.

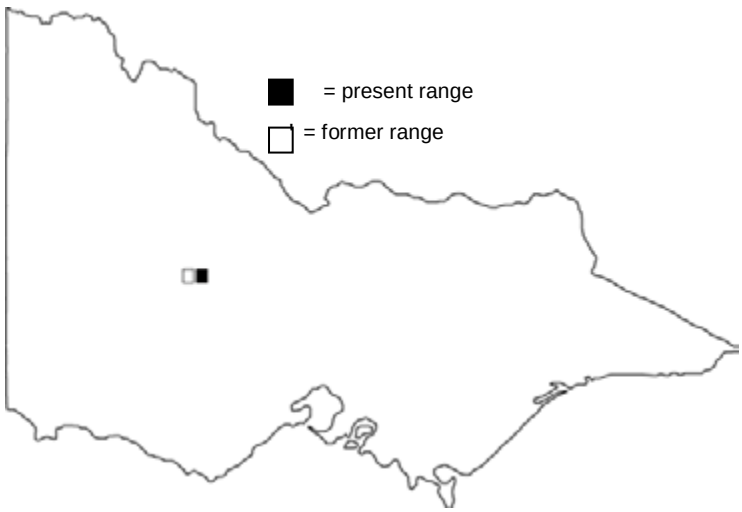

Figure 1. Distribution of *Caladenia cretacea*

Habitat

Caladenia cretacea occurs in mixed *Eucalyptus* species (*E*. *leucoxylon*, *E*. *microcarpa* and *E*. *goniocalyx*) woodland with a heathy understorey typically dominated by *Calytrix tetragona*, *Brachyloma ciliatum*, *Astroloma conostephioides*, *Astroloma humifusum*, *Hibbertia* species and *Leucopogon virgatus* on well drained grey-brown sandy loam soils.

Population Details

Caladenia cretacea is currently only known from a single population near Stuart Mill, where it grows in a flora and fauna reserve, managed by Parks Victoria. A collection attributed to *C. cretacea* is known from a roadside south of Stuart Mill, although with imprecise collection details, but no plants are currently known from the area. Location details will generally be kept confidential to protect the orchid.

Decline and Threats

Almost nothing is known of the previous distribution and abundance of *C. cretacea*. However, only small patches of habitat remaining in the district, so it is likely that the species was once more common but has declined due to loss of habitat. The vicinity of the roadside collection attributed to *C. cretacea* has been searched over several seasons, and no plants were found. Little suitable habitat remains, and it is likely that this population is now extinct.

A variety of current and potential threats facing *C. cretacea* exist:

- Weed invasion, especially by pasture grasses, is a current and potential problem, as the site is surrounded by farmland on all sides.
- Grazing by kangaroos and rabbits is a serious problem at this site. In 2002, seed set was only observed in caged plants, and all other flowering plants were grazed by herbivores.
- Trampling by visiting orchid enthusiasts, accidentally damaging plants or unknowingly trampling seedlings is a threat at this site.
- There is a high risk of extinction from stochastic events due to the small population size.

Existing Conservation Measures

The endangered Red Cross Spider-orchid orchid *Caladenia cruciformis*, which is the subject of a current recovery plan (Coates *et al.* 2002), also grows in the reserve. As a result, a number of conservation measures have already been undertaken at this site that benefit *C. cretacea*, including:

- Searches for *C. cretacea* in the district since 1999.
- Monitoring of the population (as part of the *C. cruciformis* monitoring program) since 2001.
- Hand pollination and seed collection.
- Caging of some plants to prevent predation and trampling.
- Collection of leaf samples for use in a state-wide molecular analysis of spider orchid populations for taxonomic purposes.

Caladenia insularis G.W. Carr French Island Spider-orchid

Description

The French Island Spider-orchid *Caladenia insularis* is a small terrestrial, deciduous herb that emerges annually from a spherical subterranean tuber. There is a single basal, lax, hairy, lanceolate reddish-green leaf to 10 cm long. The erect, hairy flower stem grows to 40 cm tall and has one or two moderately large creamy flowers with variable reddish streaks, the labellum red with yellowish streaks. The sepals and petals are up to 40 mm long, slender, the sepal tips with short, distinct clubs; the dorsal sepal is erect, the petals and lateral sepals spreading and deflexed. The labellum is narrowly triangular, the tip rolled under, the margins with very short blunt teeth decreasing in size and extending to about mid-way along the labellum, while the lamina has four rows of very short, curved calli (description from Backhouse & Jeanes 1995). Little is known of the ecology of *C. insularis*. Plants have a summer dormancy period, with growth occurring during late autumn, winter and spring, and the species flowers in September and October. Plants reproduce solely from seed. Pollination is almost certainly via pseudocopulation, with the dense, apical clubs on the sepals emitting pheromones that attract male thynnid wasps (Backhouse & Jeanes 1995), although the pollinator of *C. insularis* is not known. Response to fire is not known.

Distribution

Caladenia insularis is endemic to French Island in Western Port in southern Victoria, in the South East Coastal Plain IBRA bioregion (DEH 2000) (Figure 2). Maps showing the distribution of *C. insularis* are available from the Department of Sustainability and Environment.

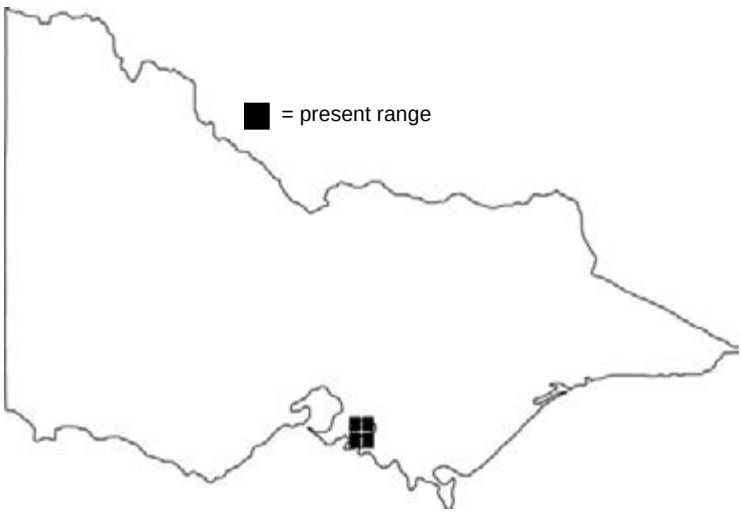

Figure 2. Distribution of *Caladenia insularis*

Habitat

Caladenia insularis occurs in heathland and heathy woodland dominated by Manna Gum *Eucalyptus viminalis*, with a diverse understorey of heathy shrubs, on soils varying from light grey loamy sand to gravely red clay loam. Some sites are seasonally waterlogged. Flowering appears to be enhanced by summer wildfires or slashing of the surrounding vegetation. Otherwise, flowering plants tend to be restricted to open areas between shrubs. Recovery actions include survey and mapping of habitat that will lead to the identification of habitat critical to the survival of the species.

Population Information

Caladenia insularis is known from a single population comprising five separate sub-populations, four occurring within the French Island National Park, and the fifth occurring on unreserved crown land. Total population size is about 130 plants, with subpopulations containing from 15–50 plants. Location details will generally be kept confidential to protect the orchid.

Decline and Threats

Little is known of the previous distribution and abundance of *C. insularis*, other than it appears to be endemic to French Island (Carr 1995), and there is no information indicating if there has been any decline. Although it seems to be rare, the species possibly occurs elsewhere, as its dense heath and heathy woodland habitat still covers much of the island. However, as flowering is probably stimulated by fire or by mechanical removal of competing vegetation such as through mowing, flowering plants are not often seen.

Although most sites occur within the French Island National Park, a variety of current and potential threats facing *C. insularis* exits, including:

- Weed invasion by *Phalaris* sp. (canary grass) is a threat at the French Island NP (1) site. Weed invasion, through colonisation of bare ground, is a threat at the French Island (Quarry) site.
- Grazing and trampling by feral goats, deer and rabbits is a serious threat at all sites.
- Trampling by visiting orchid enthusiasts, accidentally damaging plants or unknowingly trampling any seedlings in the immediate vicinity of the plants is a serious threat at all sites. The two subpopulations that occur along vehicle tracks are at risk of accidental damage from vehicle and machinery movement.
- There is a high risk of extinction from stochastic events due to small population size.

Existing Conservation Measures

A number of conservation measures have already been undertaken for *C. insularis*, including:

- Monitoring of populations by local orchid enthusiasts.
- Mosaic ecological burning in the park to maintain species diversity, including stimulating flowering of *C. insularis*.
- Collection of leaf samples for use in taxonomic molecular analysis of spider-orchid populations.

Caladenia ornata (Nicholls) D.L. Jones Ornate Pink Fingers

Description

The Ornate Pink Fingers *Caladenia ornata* is a small terrestrial, deciduous herb that emerges annually from a spherical subterranean tuber. There is a single basal slender green leaf to 60 mm long. The erect flower stem grows to 30 cm tall and has 1–3 small pale to deep pink flowers, the labellum bright red with darker red bars. The sepals and petals are about 20 mm long and lanceolate; the dorsal sepal is erect, the petals and lateral sepals horizontal and pointing forward. The labellum has broad, erect side lobes and a narrow, strap-like apex, and has two rows of short, clubbed, lamina calli (description from Backhouse & Jeanes 1995). Little is known of the ecology of *C. ornata*. Plants have a summer dormancy, with growth occurring during late autumn, winter and spring, and the species flowers in September and October. Plants reproduce solely from seed. Pollination is believed to be performed by small native bees and flies; the plants may also be self-pollinating (Backhouse & Jeanes 1995). Response to fire is not known.

Distribution

Caladenia ornata occurs in south-western Victoria and adjacent areas of South Australia, within the area bounded by Portland, Stawell, Kiata and Bangham (Figure 3). It occurs in the Naracoorte Coastal Plain, Victorian Midlands and Murray-darling Depression IBRA bioregions (*sensu* DEH 2000). The distribution of *C. ornata* is poorly known, especially in South Australia, where it has only been recently recognised as occurring in that State (NOSSA 2007). Maps showing the distribution of *C. ornata* are available from the Department of Sustainability and Environment (for Victoria) and the Department for Environment and Heritage (for South Australia).

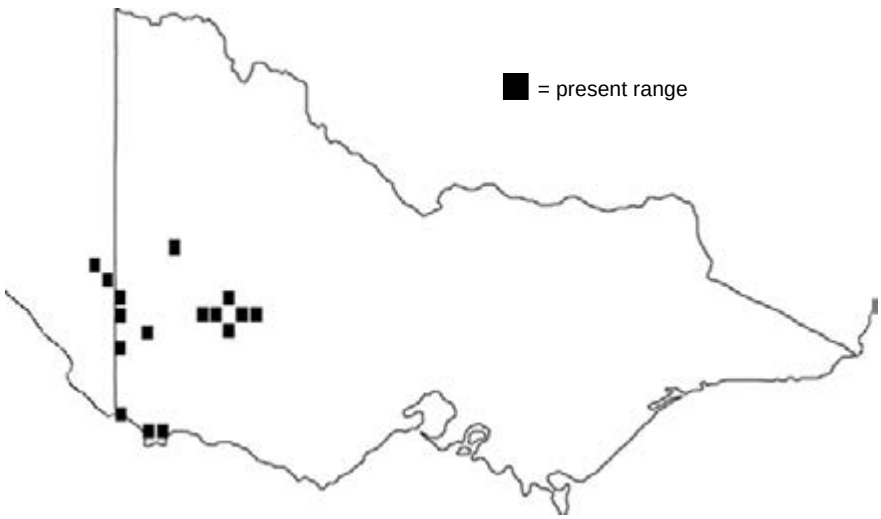

Figure 3. Distribution of *Caladenia ornata*

Habitat

Caladenia ornata occurs in a variety of grassy and heathy woodland, including *Eucalyptus camaldulensis* woodland with a grassy understorey on clay loam soils, sparse *Eucalyptus melliodora*/*Eucalyptus leucoxylon* woodland with a dry, heathy understorey and gravely clay loam soils, and *Eucalyptus obliqua*/*Eucalyptus baxteri* forest with a dense, heathy understorey and grey sandy loam soils. Recovery actions include survey and mapping of habitat that will lead to the identification of habitat critical to the survival of the species.

Population Details

There are currently about 18 records attributed to *C. ornata* in Victoria and two in South Australia, although most of these have imprecise location information and no population size estimates. Several populations were relocated and surveyed as part of preparation of this Recovery Plan, and this information is presented in Table 3. Detailed surveys in Victoria and South Australia to determine population size and location will be undertaken as part of implementation of this Recovery Plan.

Table 3. Population information for *Caladenia ornata*

Location	Size	Area	Mgr
Grampians State Forest	~100 plants	~50 ha	DSE
Lower Glenelg National Park	~50 plants	<2 ha	PV
Little Desert National Park	~20 plants	<5 ha	PV
Little Desert National Park	~20 plants	<5 ha	PV
Deep Lead Nature Conservation Reserve	~20 plants	<5 ha	PV
Meereek State Forest	~20 plants	<2 ha	DSE
Roseneath State Forest	~20 plants	<5 ha	DSE
Tallageira State Forest	~20 plants	<2 ha	DSE

Decline and Threats

Virtually nothing is known of the previous distribution and abundance of *C. ornata*, so it is difficult to determine if there has been any decline and range or abundance of the species. It is likely that the species is under-reported or has been overlooked, due to its similarity to other small-flowered species in the *Caladenia carnea* complex. More precisely determining decline of and threats to *C. ornata* populations will be determined as part of implementation of this Recovery Plan.

A variety of current and potential threats exist at the known sites of *C. ornata* populations:

- Weeds are a serious problem at some sites, including the flatweed *Hypochoeris radicata* and pasture grasses at the Grampians SF site, and Coast Wattle *Acacia longifolia* invasion in the vicinity of the Lower Glenelg NP site.
- Grazing by rabbits/hares and possibly kangaroos/wallabies is a threat at most sites. There is some evidence of stock (sheep and/or cattle) grazing/trampling at the Grampians SF site.
- Some plants grow on or close by roads/tracks at the Grampians, Deep Lead and Lower Glenelg NP sites, making them at risk from vehicle traffic and maintenance activities.
- There is a high risk of extinction due to the apparent small population size at some locations.

Caladenia sp. aff. *fragrantissima* (Central Victoria) Bendigo Spider-orchid

Description

The Bendigo Spider-orchid *Caladenia* sp. aff. *fragrantissima* is a small terrestrial, deciduous herb that emerges annually from a spherical subterranean tuber. There is a single basal, lax, hairy, lanceolate reddish-green leaf to 12 cm long. The erect, hairy flower stem grows to 40 cm tall and has one or two large creamy white flowers with reddish purple labellum calli and marginal teeth. The sepals and petals are up to 60 mm long, slender, with filamentous tips covered with sparse reddish-brown glands; the dorsal sepal is erect, the petals and lateral sepals spreading and deflexed. The labellum is narrowly triangular, the tip rolled under, the margins with short blunt teeth decreasing in size and extending almost to the apex, while the lamina has 4–6 rows of short, curved, bluntly pointed calli (description from Jeanes & Backhouse 2006). Little is known of the ecology of *C.* sp. aff. *fragrantissima*. Plants have a summer dormancy, with growth occurring during late autumn, winter and spring, and the species flowers in September and October. Plants reproduce solely from seed. Pollinators and response to fire are not known.

Distribution

Caladenia sp. aff. *fragrantissima* is endemic to Victoria, where it occurs near Bendigo, in the Victorian Midlands IBRA bioregion (*sensu* DEH 2000) (Figure 4). Maps showing the distribution of *C.* sp. aff. *fragrantissima* are available from the Department of Sustainability and Environment.

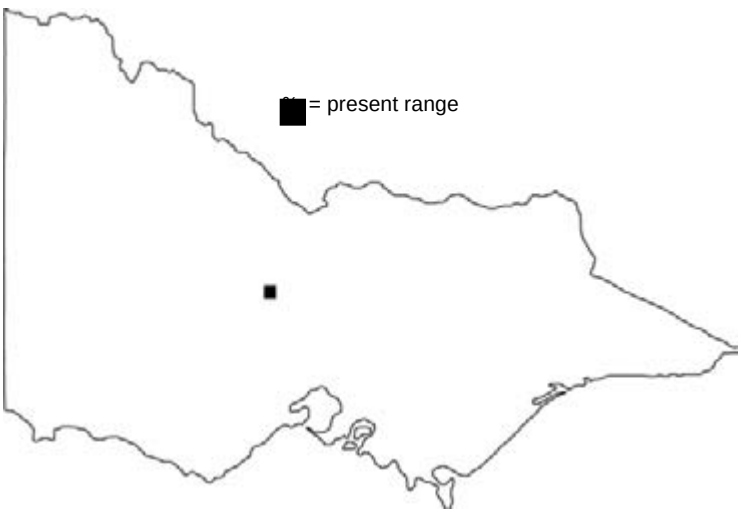

Figure 4. Distribution of *Caladenia* sp. aff. *fragrantissima*

Habitat

Caladenia sp. aff. *fragrantissima* occurs in mixed box *Eucalyptus* forest of *E. melliodora*, *Eucalyptus polyanthemos* and *Eucalyptus macrorhyncha* forest with a sparse shrubby and grassy understorey including *Acacia pycnantha*, *Acacia acinacea* and tussock grasses, on well-drained, light brown gravely loam soil with exposed rocky outcrops. Recovery actions include survey and mapping of habitat that will lead to the identification of habitat critical to the orchid's survival.

Population Details

Caladenia sp. aff. *fragrantissima* is known from a single location and just two plants. The site is within the Greater Bendigo National Park, managed by Parks Victoria. Location details will generally be kept confidential to protect the orchid.

Decline and Threats

The previous distribution and abundance of *C.* sp. aff. *fragrantissima* is not known. However, the box forest habitat of *C.* sp. aff. *fragrantissima* has had a long history of disturbance (Muir *et al.* 1995), especially from mining, which was prevalent in the area where the species currently grows. The forest was also heavily harvested for timber, to the extent that little remains in original condition. It is quite possible that other populations of the species once existed, but have been lost due to the extensive habitat disturbance that occurred in the region for well over 100 years.

A variety of current and potential threats face *C.* sp. aff. *fragrantissima*, including:

- Trampling by visiting orchid enthusiasts, accidentally damaging plants or unknowingly trampling any seedlings in the immediate vicinity of the plants is a serious threat at this site. It is critical that exact location details remain confidential, and visitation is kept to a minimum.
- Grazing of the surrounding vegetation by kangaroos/wallabies and rabbits.
- Plants have flowered only about once every 2–3 years over the last decade due to the continuing drought.
- There is an extremely high risk of extinction from stochastic events due to the tiny population size.

Existing Conservation Measures

A number of conservation measures have already been undertaken to conserve *C.* sp. aff. *fragrantissima*, including:

- Annual monitoring by local field naturalists.
- Caging of the plants to prevent predation and trampling.
- Hand-pollination of plants, seed pod collection and seed spread around the base of existing plants to encourage seedling establishment (R. Brown, pers. comm.).
- Reservation of the site and surrounding area as part of the new Greater Bendigo National Park.
- Exclusion of the site and the surrounding area from routine prescribed burning (R. Orr, pers. comm.).

Caladenia sp. aff. *rosella* (Violet Town) Violet Town Spider-orchid

Description

The Violet Town Spider-orchid *Caladenia* sp. aff. *rosella* is a small terrestrial, deciduous herb that emerges annually from a spherical subterranean tuber. There is a single basal, lax, hairy, lanceolate reddish-green leaf to 12 cm long. The erect, hairy flower stem grows to 25 cm tall and bears one or two dull reddish and greenish flowers. The sepals and petals are up to 45 mm long, slender, with slightly thickened glandular tips; the dorsal sepal is erect, the petals and lateral sepals spreading and deflexed. The labellum is narrowly triangular, the tip rolled under, the margins with short blunt teeth decreasing in size and extending almost to the apex, while the lamina has 4–6 rows of short, curved, bluntly pointed calli (description from Jeanes & Backhouse 2006, named as *C*. sp. aff. *concolor* 2). Little is known of the ecology of *C.* sp. aff. *rosella*. Plants have a summer dormancy, with growth occurring during late autumn, winter and spring, and flowering in September and October. Plants reproduce solely from seed. Pollinators and response to fire are not known.

Distribution

Caladenia sp. aff. *rosella* is endemic to Victoria, where it is known from only a single site near Violet Town, in the Victorian Midlands IBRA bioregion (*sensu* DEH 2000) (Figure 5). Maps showing the distribution of *C.* sp. aff. *rosella* are available from the Department of Sustainability and Environment.

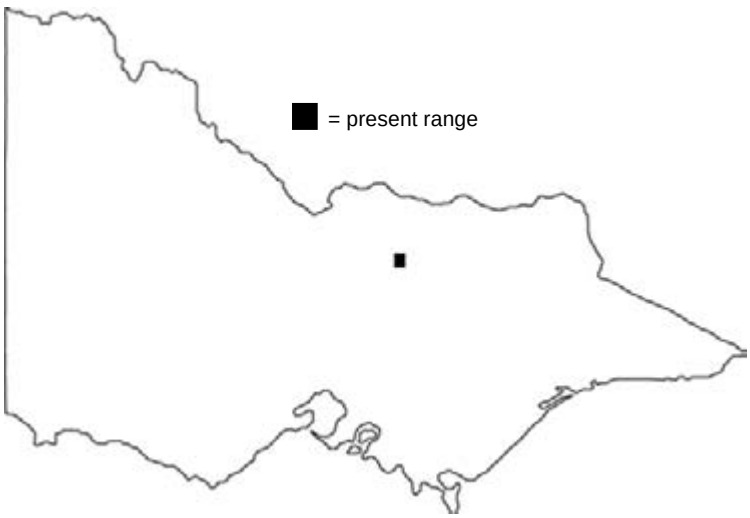

Figure 5. Distribution of *Caladenia* sp. aff. *rosella*

Habitat

Caladenia sp. aff. *rosella* occurs in dry box woodland with an overstory comprising *Eucalyptus microcarpa* and *Eucalyptus polyanthemos* with occasional Green Mallee *Eucalyptus viridis*, and an understorey containing *Acacia pycnantha*, *Joycea pallida* and numerous low heath species, on gravely, light brown clay loam soil. Recovery actions include survey and mapping of habitat that will lead to the identification of habitat critical to the survival of the species.

Population Details

Caladenia sp. aff. *rosella* is known only from a single location and just four plants. The site is on private land managed largely for agriculture. Location details will generally be kept confidential to protect the orchid.

Decline and Threats

There is no reliable information that indicates the historical range of *C.* sp. aff. *rosella*. The district where it occurs has been substantially cleared for agriculture, with only small isolated pockets of vegetation remaining. It seems likely that *C.* sp. aff. *rosella* has suffered a decline in range and abundance due to loss of habitat. The orchid is at an extremely high risk of extinction from stochastic events due to the tiny population size. A variety of current and potential threats exist at the population site. These include:

- Grazing by stock (sheep), kangaroo and rabbits is a serious potential threat. Digging of orchid tubers by White-winged Choughs also occurs, although the threat to *C.* sp. aff. *rosella* is now largely alleviated by fencing the site and caging plants.
- Weeds including Large Quaking Grass *Briza maxima*, Pimpernel *Anagallis arvensis* and pasture grasses are a constant threat.
- Plants have flowered only sporadically in the last decade, with several years missed due to the extended drought conditions prevailing in the district.
- Low fecundity may be a serious threat to this species. Three of the four known plants have been observed with malformed anthers in some years, and may be seasonally sterile. Attempts to cross-pollinate plants and produce seed have so far been unsuccessful (Chris Findlay pers. comm.).

Existing Conservation Measures

A number of measures have already been undertaken for the conservation of *C.* sp. aff. *rosella*, including:

- Annual monitoring of the population by the landholder.
- Occasional hand watering of plants during extended dry periods.
- Caging of plants to prevent predation and trampling
- Periodic removal of vegetation near the plants to reduce competition.
- Fencing of the site to exclude stock and kangaroos.

Corunastylis sp. aff. *nudiscapa* (Otway Ranges) Otways Midge-orchid

Description

The Otways Midge-orchid *Corunastylis* sp. aff. *nudiscapa* (Otway Range) is a very small terrestrial, deciduous herb growing to only 70 mm in height, that emerges annually from a spherical subterranean tuber. It has single terete, hollow, reddish-purple leaf to 60 mm long. The flower stem grows up inside the leaf and emerges from a slit near the top of the leaf, leaving a short free portion just below, or amongst, the flowers. The stem has up to 30 tiny nodding, glabrous reddish brown to purple non-resupinate flowers about 5 mm across, arranged in a short, densely crowded spike. The lateral sepals are spreading and deflexed, the dorsal sepal and petals closely embracing the column, while the labellum is triangular (description from Jeanes & Backhouse 2006).

Little is known of the biology and ecology of *C.* sp. aff. *nudiscapa*. Flowering occurs in November, and pollination is believed to be performed by small vinegar and fruit flies. Following pollination, the inflorescence elongates considerably, to aid wind-borne seed dispersal (Backhouse & Jeanes 1995; Bishop 1996).

Distribution

Corunastylis sp. aff. *nudiscapa* is endemic to Victoria, where it is known from a single site in the South Eastern Highlands IBRA bioregion (DEH 2000) (Figure 6). Maps showing the distribution of *C. nudiscapa* are available from the Department of Sustainability and Environment.

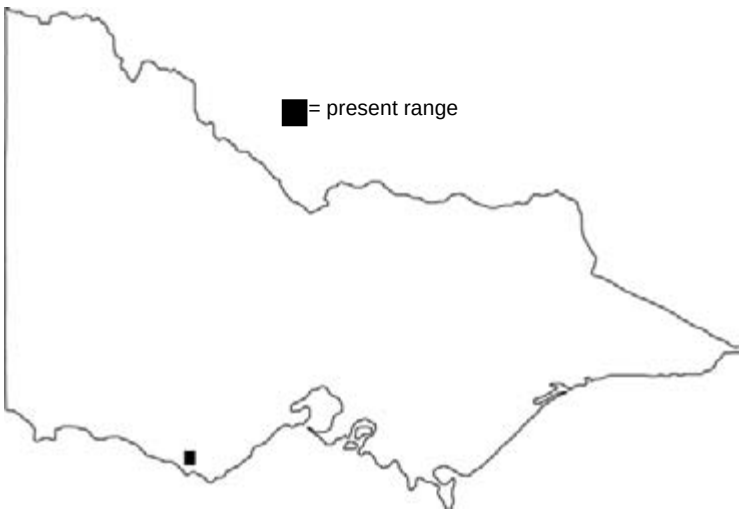

Figure 6. Distribution of *Corunastylis* sp. aff. *nudiscapa*

Habitat

Corunastylis sp. aff. *nudiscapa* grows in heathy woodland, with an overstorey of *Eucalyptus obliqua* and *Eucalyptus baxteri*, and a dense understorey dominated by *Leptospermum continentale*, *Hakea ulicina*, *Xanthorrhoea australis*, *Banksia marginata*, *Dillwynia glaberrima* and *Pultenaea mollis*, on red-brown clay loam soils. The few plants known grow in open, relatively bare areas between the shrubs. Recovery actions include survey and mapping of habitat that will lead to the identification of habitat critical to the survival of the species.

Population Details

Corunastylis sp. aff. *nudiscapa* is known only from a single population containing six plants, growing in the Great Otway National Park (managed by Parks Victoria). Location details will generally be kept confidential to protect the orchid.

Decline and Threats

Nothing is known of the former distribution and abundance of *C.* sp. aff. *nudiscapa*, as the species was only discovered about 17 years ago, and has only ever been known from one tiny population. It has not been seen in flower for the past five years, and it may require periodic summer fire to stimulate flowering in its dense, heathy habitat. Threats are not known, but may include removal of fire or burning at the wrong time (e.g. in spring). There is a high risk of extinction from stochastic events due to the small population size. A more detailed threat assessment is proposed should the species be discovered in flower again.

Corybas sp. aff. *diemenicus* (Coastal) Late Helmet Orchid

Description

The Late Helmet-orchid *Corybas* sp. aff. *diemenicus* (Coastal) is a tiny summer-dormant, terrestrial, deciduous herb that emerges annually from a spherical subterranean tuber. There is a single ground-hugging heart-shaped leaf to 12 mm wide, and a single translucent dark reddish flower to 10 mm wide borne on a short stem and held just above the leaf. The labellum is rounded, with a dark red central mound and flared, coarsely-toothed margins. The dorsal sepal caps the labellum, while the petals and lateral sepals are reduced to short, fine appendages and held against the ovary (description from Jeanes & Backhouse 2006). The species flowers in September and October.

Distribution

Corybas sp. aff. *diemenicus* occurs in Victoria and the extreme southeast corner of South Australia, between Wilsons Promontory in the east and near Port Macdonnell in the west (Figure 7), in the South East Coastal Plain and Naracoorte Coastal Plain IBRA bioregions (*sensu* DEH 2000). Maps showing the distribution of *C.* sp. aff. *diemenicus* are available from the Department of Sustainability and Environment (for Victoria) and the Department for Environment and Heritage (for South Australia).

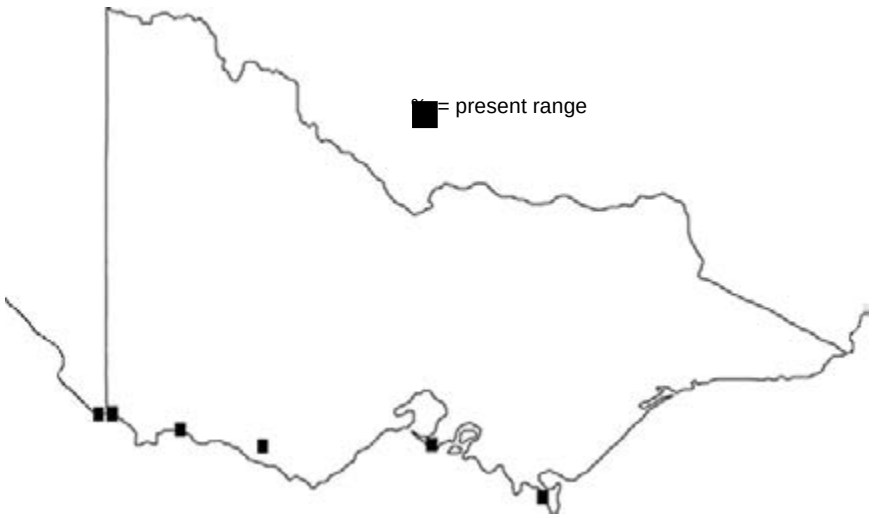

Figure 7. Distribution of *Corybas* sp. aff. *diemenicus*

Habitat

Corybas sp. aff. *diemenicus* occurs in closed scrub dominated by Woolly Tea Tree *L. lanigerum* in swamps and along watercourses on waterlogged, black, peaty alkaline soils. The understorey is relatively open, with a herbaceous ground layer that may include *Gahnia* species, *Viola hederacea*, *Lobelia* species, *Selliera radicans*, *Urtica insisa*, *Carex appressa*, *Schoenus nitens*, *Geranium molle* and various mosses and small ferns (Coates *et al.* 2002). Within the *L. lanigerum* stands, plants generally occur on small mounds a few cm above the normal inundation level. Populations occur in small isolated patches on only a few square metres. Recovery actions include survey and mapping of habitat that will lead to the identification of habitat critical to the survival of the species.

Population Details

Corybas sp. aff. *diemenicus* is known from seven populations containing about 1,300 plants (Table 4). Other threatened orchid species are present at some of the sites, and location details will generally be kept confidential to protect these orchids.

Table 4. Population information for *Corybas* sp. aff. *diemenicus*

Location (east to west)	Size	Extent	Mgr	Reasons
Victoria				
Wilsons Promontory National Park	~500 plants	<1 ha	PV	largest population and only one east of Otway Ranges
Mornington Peninsula National Park	?	?	PV	probably extinct at this site
Timboon (private property)	~300 plants	<1 ha	private	
Tyrendarra (private property)	~40 plants	<1 ha	private	
Discovery Bay Coastal Park	15 plants	<1 ha	PV	
Nelson (private property)	~100 plants	<1 ha	private	
South Australia				
Piccaninnie Ponds (Conservation Park and private property)	~325 plants	<6 ha	DEH/private	about 25 plants occur in the park and 300 plants on private property

Abbreviations: DEH = Department for Environment and Heritage; PV = Parks Victoria

Recovery actions for the Mornington Peninsula and Wilsons Promontory NP populations of *C*. sp. aff. *diemenicus* were prepared as part of a previous recovery plan (Coates *et al.* 2002). At that time, these populations were considered to be a separate species to the western Victorian and South Australian populations. However, they have since been determined to be the same species (J. Jeanes, National Herbarium of Victoria, pers. comm.), so this Recovery Plan incorporates actions from Coates *et al.* (2002) as well as new actions for the other sites.

Decline and Threats

The historical range and distribution of *C.* sp. aff. *diemenicus* is not known, but it is likely to have been more cG$t ~Q*Ht mmon prior to-landscape disturbance, particularly from weed invasion and draining and clearing of Woolly Tea Tree scrub for agriculture. While *C.* sp. aff. *diemenicus* remains widely distributed, all populations are small, fragmented and isolated from one another. At least one (Mornington Peninsula NP) is probably extinct. While the largest population is reserved in the Wilsons Promontory National Park, most populations and plants occur on private property, and will require sympathetic management to survive. Remaining populations face a range of current and potential threats, including:

- Weed invasion – by a wide variety of weed species, is a significant problem at all sites, especially the flatweed *Hypochoeris radicata* and *Solanum* sp. at the Wilsons Promontory NP site, and Climbing Groundsel *Senecio angulatus* at the Mornington Peninsula NP site (where plants have not been seen for over a decade).
- Grazing – by stock and/or native and introduced herbivores, is as serious threat at all sites.
- Site disturbance – by sheep/cattle is a serious threat at all unfenced private property sites, as they are capable of forcing their way through the dense understorey, breaking up the vegetation, damaging soil structure and trampling plants. Trampling by Hog Deer is a threat at the Wilsons Promontory NP site. Accidental trampling and site disturbance through management activities is a problem in Wilsons Promontory NP, as some plants occur close to the access track.
- Drought/climate change – all sites are at risk of drying out due to prolonged drought in south-eastern Australia, and there has already been dieback of Woolly Tea Tree at some sites.
- There is a high risk of local extinctions due to small population sizes at some sites.

Existing Conservation Measures

Periodic monitoring of several populations of *C.* sp. aff. *diemenicus* has occurred since 2001.

Paracaleana disjuncta D.L. Jones Grampians Duck Orchid

Description

The Grampians Duck-orchid *Paracaleana disjuncta* is a small terrestrial, deciduous herb that emerges annually from a spherical subterranean tuber. It has a distinctive small (to 10 mm long) ovate grey-green basal leaf with a purplish underside, that is usually withered at flowering time. The slender flower stem grows to 15 cm tall and bears a single (rarely two) small, non-resupinate, dull reddish brown flower. The sepals and petals are reduced to small slender threads flanking the column, which has greatly inflated column wings. The labellum has a narrowly ovate flat lamina to 10 mm long, the apical third covered with dark, shiny, wart-like calli. The labellum is attached to the column by a curved, flat strap, and is sensitive to touch. At the touch of a pollinator, the labellum is propelled between the column wings, trapping the pollinator against the anther to effect pollination (description from Jones 2003). Little is known of the biology and ecology of *Paracaleana disjuncta*. Tubers are dormant during late summer and autumn, with growth occurring during winter and spring. The species flowers in November and December. The plants reproduce solely from seed. Pollination is thought to be via pseudocopulation, with the dark, apical covering of glands on the labellum emitting pheromones that attract male thynnid wasps.

Distribution

Paracaleana disjuncta occurs in Victoria and South Australia, where it is currently known from four locations. In Victoria it is known from two sites occurring in the Grampians, in the Victorian Midlands IBRA bioregion (*sensu* DEH 2000) (Figure 8). In South Australia, the species has been recorded from near Ashbourne, south-east of Adelaide, in the 1960s and 1990s, and on Kangaroo Island in the 1980s (NOSSA 2007), in the Kanmantoo bioregion. Maps showing the distribution of *P. disjuncta* are available from the Department of Sustainability and Environment (for Victoria) and the Department for Environment and Heritage (for South Australia).

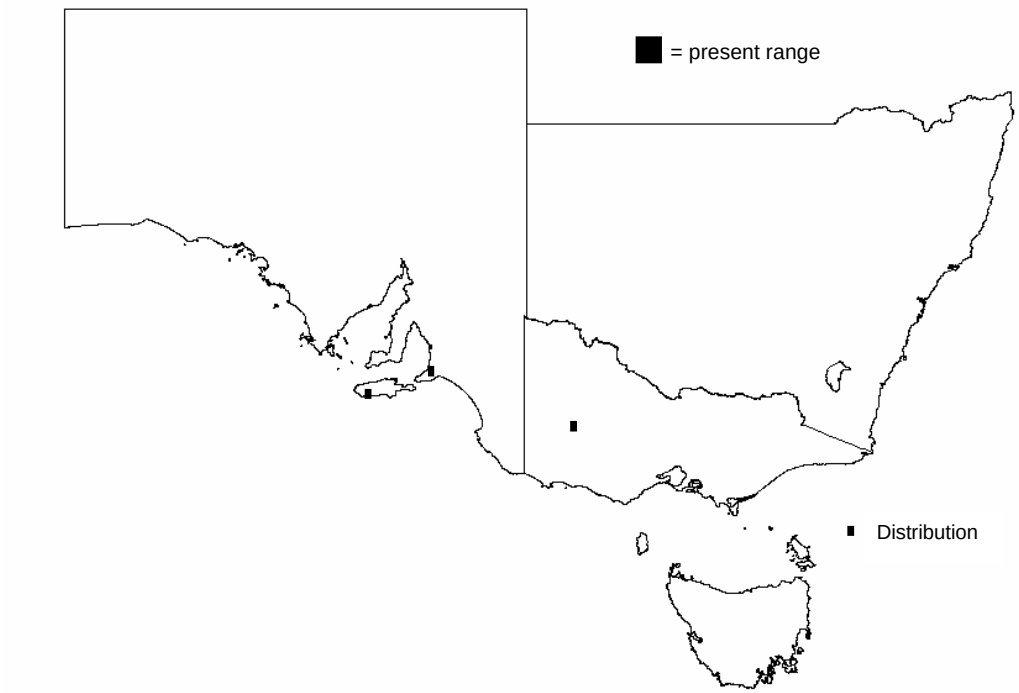

Figure 8. Distribution of *Paracaleana disjuncta*

Habitat

In Victoria, *P. disjuncta* occurs in *Eucalyptus baxteri* woodland with a diverse heathy understorey including *Astroloma conostephioides*, *Astroloma pinifolium*, *Leucopogon virgatus*, *Leptospermum myrsinoides*, *Banksia marginata*, *Acacia implexa* and *Xanthorrhoea australis*, on well-drained, light brown sandy clay loam soils. Plants occur in open, relatively bare areas between shrubs, or in moss beds at the base of trees. At the Ashbourne (SA) site, the plants grew in 'leached peaty grey sands, near soaks, growing amid low sedges with shrubby *E. baxteri*' (NOSSA 2007). There is no habitat information for the Kangaroo Island site. Recovery actions include survey and mapping of habitat that will lead to the identification of habitat critical to the survival of the species.

Population Details

Paracaleana disjuncta has only been recorded from four sites: two in Victoria and two in South Australia. The two Victorian sites (Roses Gap and Mirranatwa) are in the Grampians National Park, about 50 km apart; the Roses Gap population contains about 25 plants, while Mirranatwa has about 100 plants. The species has not been seen at either of the South Australian locations for over 15 years and it is not certain if populations are still extant there. Location details will generally be kept confidential to protect the orchid.

Decline and Threats

Almost nothing is known of the previous distribution or abundance of *P. disjuncta*, although it seems to be a naturally rare orchid. Of major concern is the apparent disappearance of the species from the two sites in South Australia, despite repeated searches, especially at the Ashbourne location. It was thought that plants flower only after fire or some other disturbance (NOSSA 2006), although plants at both Victorian populations flower in most years in the absence of fire, with winter rainfall seeming to be the most important determinant of flowering rates.

Threats to the two Victorian populations are not precisely known, although grazing by kangaroos and wallabies is a potential threat. Due to the small stature of the plants, accidental trampling caused by orchid enthusiasts is a threat (for this reason location details will be kept confidential). The conditions for seed recruitment and maintenance of the pollinator and fungal activity are unknown. There is a very high risk of extinction due to stochastic events because of the small population size. Proposed recovery actions include a more detailed assessment of threats and mitigation measures.

Existing Conservation Measures

Several measures have already been undertaken for the conservation of *P. disjuncta*, including the following:

- The Roses Gap site was originally private land, and was purchased for inclusion in the Grampians National Park in 2005.
- Track closure has prevented vehicle access at the Mirranatwa site.
- Monitoring plots have been established at both sites and monitoring undertaken annually.
- Leaf and stem material was sent to Kings Park and Botanic Gardens in Western Australia for isolation of the myccorhizal fungi as part of seed germination trials.
- Regular searches (unsuccessful) of the Ashbourne (SA) site.

Pterostylis cheraphila D. L. Jones & M. A. Clem. Floodplain Rustyhood

Description

The Floodplain Rustyhood *Pterostylis cheraphila* is a small, terrestrial deciduous herb that is summer-dormant and emerges annually from a spherical subterranean tuber. It produces a basal, stem-encircling, ground-hugging rosette of 3–12 ovate leaves to 40 mm long, following autumn rains. The slender to moderately stout stem grows to 25 cm tall, and bears up to six glossy reddish brown to greenish flowers. The dorsal sepal and petals are united to form a galea about 15 mm long, the dorsal sepal with a long slender tip. The lateral sepals are deflexed, united at their base, and have long slender divergent tips. The labellum is obovate, with numerous short marginal setae, a few longer basal setae and a pair of forward-pointing setae at the base, and is attached to the base of the column by a moveable claw that is triggered by a pollinator (typically small gnats and flies), propelling the labellum against the column (description from Backhouse & Jeanes 1995). Flowering occurs in October and November, by which time the basal rosette has usually senesced.

Distribution

Pterostylis cheraphila is endemic to western Victoria, centred around Dimboola and Murtoa, in the Murray Darling Depression IBRA bioregion (*sensu* DEH 2000) (Figure 9). Maps showing the distribution of *P. cheraphila* are available from the Department of Sustainability and Environment.

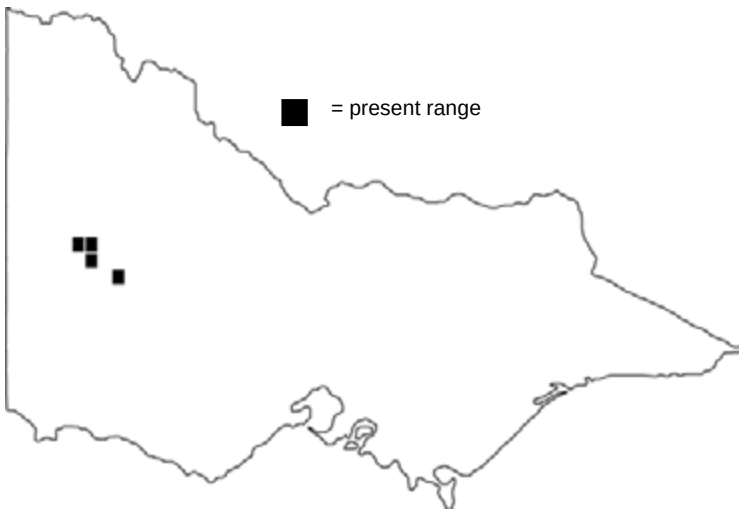

Figure 9. Distribution of *Pterostylis cheraphila*

Habitat

Pterostylis cheraphila grows in open *Eucalyptus largiflorens*/*Eucalyptus leucoxylon* woodland with a sparse grassy understorey, on seasonally inundated, heavy, grey-black clay soils. A couple of sites occur on the floodplain of the Wimmera River. Recovery actions include survey and mapping of habitat that will lead to the identification of habitat critical to the survival of the species.

Population Details

Pterostylis cheraphila is currently known from about 4,000 plants in just three populations (Table 5). Location details will generally be kept confidential to protect the orchid.

Table 5. Population information for *Pterostylis cheraphila*

Location	Size	Extent	Mgr	Comments
Dimboola: Little Desert National Park & Wail State Forest	~2,500 plants	~200 ha	PV/DSE	most plants occur in LDNP; with 200 plants in Wail
Barrabool Flora & Fauna Reserve	~1,500 plants	~900 ha	PV	
Dimboola (roadside)	~10 plants	<1 ha	WWS	Very small population at a highly degraded site

Abbreviations: DSE = Department of Sustainability & Environment; PV =- Parks Victoria; WWS = West Wimmera Shire

Decline and Threats

The historical range of *P. cheraphila* is unknown, but it probably once occurred elsewhere in suitable habitat along the Wimmera River floodplain. Extensive areas of habitat in the region have been cleared, largely for agriculture, so it is likely that populations have been lost. Current threats to populations include:

- Weed invasion – pasture weeds are a serious problem at the Dimboola (roadside) site, while Veldt Grass *Ehrharta longiflora* and Fescue *Vulpia* species are a potential threat at Barrabool site. Bridal Creeper *Asparagus asparagoides* is common along the banks of the Wimmera River at the Dimboola (Little Desert/Wail) site.
- Grazing – by native (kangaroos/wallabies) and introduced (rabbits) herbivores is a serious threat at all sites.
- Disturbance to/destruction of plants and habitat – off-road activities of 4WD vehicles and trail bikes are a serious problem at the Dimboola (Little Desert/Wail) and Barrabool sites. Some plants are close to roads/tracks and at risk maintenance/management activities.
- There is a high risk of extinction due to the restricted distribution of this species.

Existing Conservation Measures

A number of conservation measures have already been undertaken for *P. cheraphila*, including:

- Periodic monitoring of the two largest populations by local orchid enthusiasts.
- Weed control, especially of Bridal Creeper, along the Wimmera River in Little Desert NP.
- Rabbit control in the Little Desert NP.
- Upgrading and realigning track works in the vicinity of the Little Desert NP population to discourage off-road driving.

Pterostylis chlorogramma D.L. Jones & M.A. Clem. Green-striped Greenhood

Description

The Green-striped Greenhood *Pterostylis chlorogramma* is a small, terrestrial deciduous herb that is summer-dormant and emerges annually from a spherical subterranean tuber. Non-flowering plants produce a rosette of 3–6 narrowly ovate, pointed leaves, either ground-hugging or on a short stem several cm off the ground. Flowering plants lack a basal rosette, and produce a long slender stem to 45 cm tall with several narrow sheathing bracts, and up to seven small, glossy, green-striped flowers with an emerald green (rarely brownish) labellum. The dorsal sepal and petals are united to form a galea to 12 mm long, the petals with prominent flanges. The lateral sepals are deflexed and united for most of their length. The labellum is oblong, slightly curved, with two short upturned hooks at the apex, and is attached to the base of the column by a moveable claw that is triggered by a pollinator (typically small gnats and flies) landing on it, propelling the labellum against the column (description from Backhouse & Jeanes 1995). Flowering occurs from July to early September, and plants reproduce entirely from seed.

Distribution

Pterostylis chlorogramma is endemic to Victoria, where it is has a wide but disjunct distribution from near Yarram in South Gippsland to near Edenhope in western Victoria (Figure 10). The species occurs in the South East Highlands, South East Coastal Plain and Naracoorte Coastal Plain IBRA bioregions (*sensu* DEH 2000). Maps showing the distribution of *P. chlorogramma* are available from the Department of Sustainability and Environment.

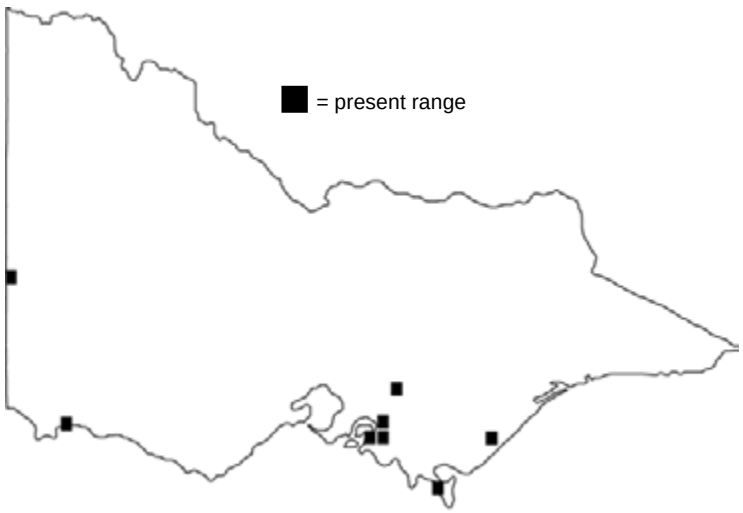

Figure 10. Distribution of *Pterostylis chlorogramma*

Habitat

Pterostylis chlorogramma occurs in mixed Box-Stringybark forest (*Eucalyptus obliqua*, *Eucalyptus radiata*, *Eucalyptus cephalocarpa* and *Eucalyptus cypellocarpa*) with a shrubby understorey, often with *Pteridium esculentum* as a major component, and including *Hakea ulicina*, *Dillwynia glaberrima*, *Pultenaea scabra*, *Banksia spinulosa*, *Epacris impressa*, *Acacia mucronata*, *Leptospermum laevigatum*, *Monotoca scoparia*, and *Bursaria spinosa*, on sandy or clay loam soils. Plants appear to be restricted to natural gaps in the shrubby understorey or occur along road/track verges. Recovery actions include survey and mapping of habitat that will lead to the identification of habitat critical to the survival of the species.

Population Details

Pterostylis chlorogramma is currently known from nine populations containing about 1,000 plants (Table 6).

Table 6. Population information for *Pterostylis chlorogramma*

Location	Size	Extent	Mgr	Comments
Gurdies Nature Conservation Reserve	~100 plants	~20 ha	PV	
Mullundung State Forest	~100 plants	<10 ha	DSE	large population at eastern end of known range
Lang Lang Nature Conservation Reserve	~50 plants	<5 ha	PV	
Mt. Clay State Forest	~50 plants	<5 ha	DSE	disjunct population
Tallageira State Forest	~50 plants	<5 ha	DSE	westernmost population
Grantville (private property)	~50 plants	<1 ha	private	
Bunyip State Park	~25 plants	<2 ha	PV	
French Island (private property)	~12 plants	<10 ha	private	
Wilsons Promontory National Park	?	?	PV	possibly extinct?

DSE = Department of Sustainability & Environment; PV =- Parks Victoria

Decline and Threats

The historical range and distribution of *P. chlorogramma* is not known, but it is likely to have been more cG$t ~Q*Ht mmon, with populations lost due to destruction of habitat for agricultural and residential development. While *P. chlorogramma* remains widely distributed, all populations are small (100 plants or less), fragmented and isolated from one another. At least one (Wilsons Promontory) is probably extinct. Remaining populations face a range of current and potential threats, including:

- Weed invasion – including pasture grasses and flat weeds, at the Grantville, Gurdies, Lang Lang and Tallageira sites.
- Grazing – by native (kangaroos/wallabies) and introduced (rabbits) herbivores is a serious threat at all sites.
- Destruction/disturbance of plants and habitat – by road maintenance, horse riding and trail bike activity, as well as accidental trampling by people, Bunyip, Lang Lang and Granville site. Plants tend to be most common along road/tracks at most sites, and are therefore at risk from accidental disturbance by road / track maintenance activities.
- There is a high risk of extinction due to small population size at some sites

Pterostylis lustra D.L. Jones Small Sickle Greenhood

Description

The Small Sickle Greenhood *Pterostylis lustra* is a small, terrestrial deciduous herb that is emerges annually from a spherical subterranean tuber. Plants have a ground-hugging basal rosette of 3–8 small ovate leaves to 15 mm long, and a slender stem to 20 cm tall, bearing a single translucent green and white flower. The dorsal sepal and petals are united to form a galea, the tips forming a long curved point, while the lateral sepals are erect, joined in the basal half, and ending in backswept, long, fine free points that project beyond the galea. The long, slender dark green labellum projects well beyond the sinus when set (description from Jones 2006a). Flowering occurs from late September to February, and plants have a short autumn dormancy.

Distribution

Pterostylis lustra is endemic to south-eastern Australia, where it is widely but sporadically distributed across southern Victoria and in the extreme south-east of South Australia, from Wilsons Promontory National Park in the east to Robe in the west (Figure 11). The species occurs in the South East Coastal Plain and Naracoorte Coastal Plain IBRA bioregions (*sensu* DEH 2000). Maps showing the distribution of *P. lustra* are available from the Department of Sustainability and Environment (for Victoria) and the Department for Environment and Heritage (for South Australia).

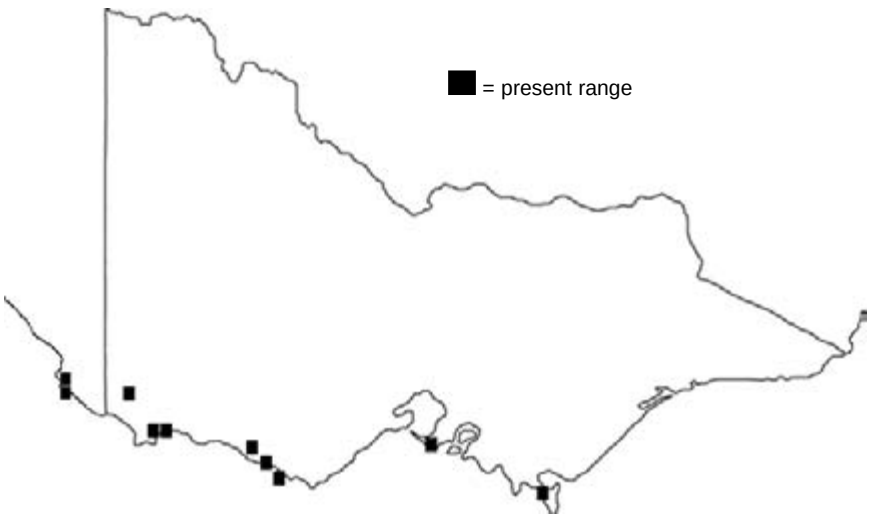

Figure 11. Distribution of *Pterostylis lustra*

Habitat

Pterostylis lustra appears to occupy a quite specific habitat, being apparently restricted to closed scrub dominated by Woolly Tea Tree *Leptospermum lanigerum* in swamps and along watercourses on waterlogged black, peaty alkaline soils. Although the canopy is continuous, the understorey is relatively open, with a herbaceous ground layer including *Gahnia* species, *Viola hederacea*, *Lobelia* species, *Selliera radicans* and *Geranium molle*. Recovery actions include survey and mapping of habitat that will lead to the identification of habitat critical to the survival of the species.

Population Details

Pterostylis lustra is currently known from 19 populations containing about 3,000 plants, 17 of which occur in Victoria and two in South Australia (Table 7).

Table 7. Population information for *Pterostylis lustra*

Location	Size	Extent	Mgr	Comments
Victoria (east to west)				
Wilsons Promontory National Park (1)	~500 plants	<5 ha	PV	One of only two populations east of Otway Ranges
Wilsons Promontory National Park (2)	~200 plants	<2 ha	PV	One of only two populations east of Otway Ranges
Cape Schanck (private property)	?	?	private	probably extinct at site
Princetown (private property)	~200 plants	<2 ha	private	
Princetown (roadside reserve)	~100 plants	<1 ha	CSC	
Lower Heytesbury (1) (roadside reserve)	~60 plants	<1 ha	CSC	
Lower Heytesbury (2) (roadside reserve)	~50 plants	<1 ha	CSC	
Curdie Vale 1 (private property)	~20 plants	<1 ha	private	
Curdie Vale 2 (private property)	~100 plants	<5 ha	private	
Curdie Vale 3 (private property)	~200 plants	<5 ha	private	
Curdie Vale 4 (private property)	~900 plants	<5 ha	private	
Curdie Vale 5 (private property)	~200 plants	<5 ha	private	
Naringal East (private property)	~30 plants	<1 ha	TfN	Trust for Nature reserve
Tyrendarra (streamside reserve)	~100 plants	<2 ha	DSE	
Cobboboonee State Forest (1)	~500 plants	<5 ha	DSE	
Cobboboonee State Forest (2)	2 plants	<1 ha	DSE	
Dartmoor (private property)	~50 plants	<1 ha	private	
South Australia				
Robe 1 (private property)	~1000 plants	<5 ha	private	
Robe 2 (private property)	~50 plants	<2 ha	private	site has been fenced

Abbreviations: CSC = Corangamite Shire Council; Department of Sustainability and Environment; PV = Parks Victoria; TfN = Trust for Nature (Victoria)

Decline and Threats

The historical range and distribution of *P. lustra* is not known, but it is likely to have been more common prior to landscape-scale disturbance, particularly from weed invasion and draining and clearing of Woolly Tea Tree scrub for agriculture. While *P. lustra* remains widely distributed, all populations are fragmented and isolated from one another, and almost one-half of the populations are small, with 100 or fewer plants. At least one (Cape Schanck) is probably extinct. While two large populations are reserved in the Wilsons Promontory National Park, many populations (including the largest known one) are on private property, and will require sympathetic management to survive. Remaining populations face a range of current and potential threats, including:

- Weed invasion – by a wide variety of weed species, is a significant problem at all sites except Cobboboonee SF (1 & 2). The threat from weeds is greatest at the small, roadside/streamside populations (Lower Heytesbury 1 & 2, Naringal East, Princetown and Tyrendarra). The Cape Schanck (private property) site is significantly degraded by weed invasion and plants have not been seen there for almost a decade now.
- Grazing – by stock and/or native and introduced herbivores, is as serious threat at almost all sites.

- Site disturbance – by sheep/cattle is a serious threat at all unfenced private property sites, as they are capable of forcing their way through the dense understorey, breaking up the vegetation, damaging soil structure and trampling plants. Trampling by Hog Deer is a threat at both Wilsons Promontory NP sites.
- Accidental trampling and site disturbance through management activities is a serious problem in Wilsons Promontory NP, as both sites are close by well-used management tracks. Trampling by visitors is a threat at the Tyrendarra streamside site. Inappropriate roadside management/maintenance activities are a potential threat to the roadside populations.
- All sites are at risk of drying out due to prolonged drought in south-eastern Australia, and there has already been dieback of Woolly Tea Tree at some sites.
- There is a high risk of local extinctions due to small population sizes at some sites.

Existing Conservation Measures

A number of conservation measures have already been undertaken for P. lustra, including:

- Periodic monitoring of Cobboboonee, Curdie Vale and Princetown sites.
- The Robe 2 (private property) site has been fenced under a South Australian remnant vegetation protection scheme.

Pterostylis sp. aff. *bicolor* (Woorndoo) Dense Greenhood

Description

The Dense Greenhood *Pterostylis* sp. aff. *bicolor* (Woorndoo) is a small, deciduous herb that emerges annually from a spherical subterranean tuber. It produces a basal, stem-encircling, ground-hugging rosette of 2–12 ovate leaves to 8 mm long. The short (up to 12 cm tall), stout stem bears up to 12 small green flowers 8–10 mm high, in a crowded, overlapping spike. The dorsal sepal and petals are united to form a galea, while the lateral sepals are deflexed, cup-like and united for most of their length. The labellum is ovate and has a distinct greenish-black basal appendage with three prominent ridges. It is attached to the base of the column by a moveable claw that is triggered by a pollinator landing on it, propelling the labellum against the column. Flowering occurs from late September to early November (description from Jeanes & Backhouse 2006). Little is known of the biology and ecology of *P.* sp. aff. *bicolor*. The pollinator is not known, although *Pterostylis* species are typically pollinated by small gnats, flies and mosquitoes (Jones 2006b). Plants reproduce solely from seed.

Distribution

Pterostylis sp. aff. *bicolor* is endemic to Victoria, where it is known from just two locations, near Dundonnel and Parwan (Figure 12), in the Victorian Volcanic Plain IBRA bioregion (*sensu* DEH 2000). Maps showing the distribution of *P.* sp. aff. *bicolor* are available from the Department of Sustainability and Environment.

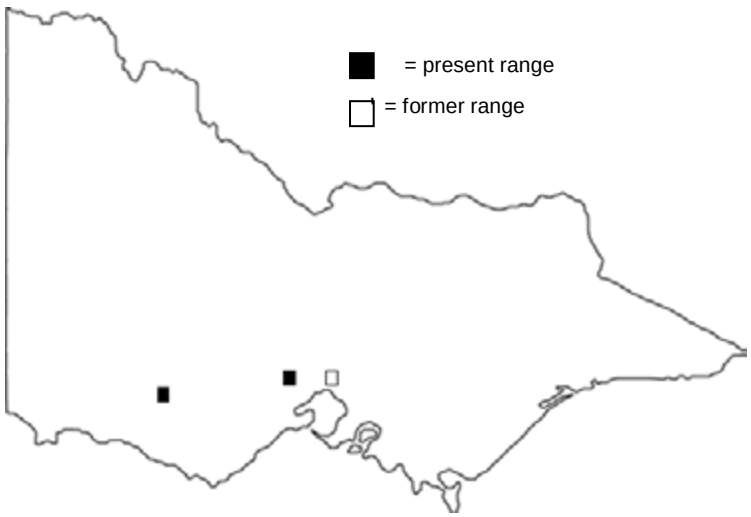

Figure 12. Distribution of *Pterostylis* sp. aff. *bicolor*

Habitat

Pterostylis sp. aff. *bicolor* populations occur in a vegetation community known as the Western (Basalt) Plains Grasslands (Craigie & Moorrees 2003) that is dominated by Kangaroo Grass *Themeda triandra* with scattered *Acacia paradoxa* and other grasses including *Austrostipa* species, *Austrodanthonia* species and *Poa* species, and many herbs including *Bulbine bulbosa* and *Chrysocephalum apiculatum*, on shallow heavy clay soils derived from basalt. Plants grow on stony rises in very shallow soils around embedded basalt boulders, often with mosses and small ferns present. Recovery actions include survey and mapping of habitat that will lead to the identification of habitat critical to the survival of the species.

Population Details

Pterostylis sp. aff. *bicolor* is known from just two populations, one on a roadside near Dundonnell containing about 50 plants, and a second on private property at Parwan, containing

about 200 plants. At the Dundonnell site it grows with three other threatened orchids: *Pterostylis.* sp. aff. *cycnocephala*, *Pterostylis.* sp. aff. *mutica* (both included in this Recovery Plan) and *Pterostylis basaltica* (Ingeme & Backhouse 1999). Location details will generally be kept confidential to protect the orchid.

Decline and Threats

Although the former distribution and abundance of *P.* sp. aff. *bicolor* will never be known, records indicate that it was once probably widespread across the Victorian Volcanic Plain bioregion. There was a population of this species near Footscray (Nicholls 1969) that is now extinct. The two remaining populations at Parwan and Dundonnell are about 150 km apart.

Habitat loss has undoubtedly been the major reason why *P.* sp. aff. *bicolor* is so threatened. The habitat in which the species grows is one of the most threatened in Australia. The Western (Basalt) Plains Grasslands once about 1 million ha of the Victorian Volcanic Plain bioregion, but has been reduced, largely through agricultural development, to about 0.15% of their original distribution (Craigie & Moorrees 2003). Now only a few thousand ha remain, in scattered, discontinuous fragments such as lightly grazed, unploughed, unfertilised paddocks and on small blocks of public land such as roadsides, rail reserves and cemeteries. These remnants continue to be degraded and lost.

The remaining populations of *P.* sp. aff. *bicolor* face a number of threats, including:

- Weed invasion, from annuals weeds and pasture grasses such as canary grass *Phalaris* species, fescue *Vulpia* species, quaking grass *Briza* species and wild oats *Avena* species. Serrated Tussock Grass *Nassella trichotoma* is a serious problem in a neighbouring property at Parwan.
- Grazing by stock (sheep) and introduced herbivores is a serious threat at both sites.
- Reduced fire frequency (or the absence of fire) from the Dundonnell site would be detrimental to this species. Periodic fire prevents dense Kangaroo Grass swards from developing and swamping out other vegetation, especially herbs.
- Road maintenance works pose some risk at Dundonnell site. The continued cooperation of the Moyne Shire is necessary to reduce the risk of site disturbance resulting from road maintenance works.
- There is a very high risk of extinction due stochastic events because of the small population sizes at both sites.

Existing Conservation Measures

The Dundonnell site contains *P. basaltica*, which was the subject of a separate recovery plan (Ingeme & Backhouse 1999). As a result, a number of conservation measures have already been undertaken at this site, including:

- The Dundonnell road reserve has been listed on the National Estate Register for its Natural Heritage Values.
- The Dundonnell site has been marked with significant native vegetation signs.
- The Dundonnell site has been burnt periodically over summer for the past 30 years as part of firebreak maintenance, which has helped reduce Kangaroo Grass dominance and maintained an open habitat favouring the persistence of small herbaceous species there.
- Negotiations with adjoining landholders has led to a reduction in stock movement along the road at Dundonnell, avoiding stock trampling and grazing on the roadside reserve.
- A rabbit-proof fence was erected around the Parwan population in 2000. The paddock is grazed outside of growing/flowering season to reduce competition from surrounding vegetation.

Pterostylis sp. aff. *cycnocephala* (Woorndoo) Cygnet Greenhood

Description

The Cygnet Greenhood *Pterostylis* sp. aff. *cycnocephala* (Woorndoo) is a small, deciduous herb that emerges annually from a spherical subterranean tuber. It produces a basal, stem-encircling, ground-hugging rosette of 2–12 ovate leaves to 8 mm long. The short (up to 10 cm tall), stout stem bears up to 12 small green flowers 8–10 mm high, in a crowded, overlapping spike. The dorsal sepal and petals are united to form a galea, while the lateral sepals are deflexed, cup-like and united for most of their length. The labellum is ovate and has a distinct greenish-black basal appendage with a forward-pointing spur. It is attached to the base of the column by a moveable claw that is triggered by a pollinator, propelling the labellum against the column. Flowering occurs from late September to early November (description from Jeanes & Backhouse 2006). Little is known of the biology and ecology of *P.* sp. aff. *cycnocephala*. The pollinator is not known, although *Pterostylis* species are typically pollinated by small gnats, flies and mosquitoes (Jones 2006b). Plants reproduce solely from seed.

Distribution

Pterostylis sp. aff. *cycnocephala* is endemic to Victoria, where it is known from a single location near Dundonnel in the Victorian Volcanic Plain IBRA bioregion (*sensu* DEH 2000) (Figure 13). Maps showing the distribution of *P.* sp. aff. *bicolor* are available from the Department of Sustainability and Environment.

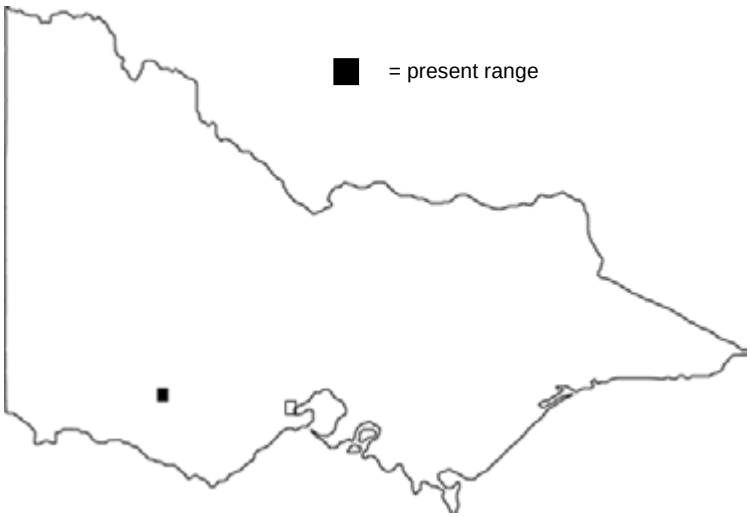

Figure 13. Distribution of *Pterostylis* sp. aff. *cycnocephala*

Habitat

Pterostylis sp. aff. *cycnocephala* occurs in Kangaroo Grass *Themeda triandra* grasslands on stony rises, with scattered *Acacia paradoxa* and other grasses including *Austrostipa* species, *Austrodanthonia* species and *Poa* species, and herbs including *Bulbine bulbosa* and *Chrysocephalum apiculatum*, on shallow heavy clay soils derived from basalt. Plants often grow in very shallow soils around embedded basalt boulders, often with mosses and small ferns present. Recovery actions include survey and mapping of habitat that will lead to the identification of habitat critical to the survival of the species.

Population Details

This species is known from ten individual plants in a single population in a roadside reserve at Dundonnell, where it grows with other threatened orchids including *P.* sp. aff. *bicolor*, *P.* sp. aff. *mutica* and *P. basaltica*. Location details will generally be kept confidential to protect the orchid.

Decline and Threats

The former distribution and abundance of *P.* sp. aff. *cycnocephala* is not known, but it once probably occurred elsewhere in Victorian Volcanic Plain bioregion. The habitat in which the species grows is one of the most threatened in Australia. The Western (Basalt) Plains Grasslands once about 1 million ha of the Victorian Volcanic Plain bioregion, but has been reduced, largely through agricultural development, to about 0.15% of their original distribution (Craigie & Moorrees 2003). Now only a few thousand ha remain, in scattered, discontinuous fragments such as lightly grazed, unploughed, unfertilised paddocks and on small blocks of public land such as roadsides, rail reserves and cemeteries. These remnants continue to be degraded and lost.

The remaining population of *P.* sp. aff. *cycnocephala* faces a number of threats, including:

- Weed invasion, from annuals weeds and pasture grasses such as canary grass *Phalaris* species, fescue *Vulpia* species, quaking grass *Briza* species and wild oats *Avena* species.
- Grazing by stock (sheep) and introduced herbivores is a serious threat.
- Reduced fire frequency (or the absence of fire) would be detrimental to this species. Periodic fire prevents dense Kangaroo Grass swards from developing and swamping out other vegetation, especially herbs.
- Road maintenance works pose some risk. The continued cooperation of the Moyne Shire is necessary to reduce the risk of site disturbance resulting from road maintenance works.
- There is a very high risk of extinction due stochastic events because of the small population size.

Existing Conservation Measures

The Dundonnell site contains *P. basaltica*, which was the subject of a separate recovery plan (Ingeme & Backhouse 1999). As a result, a number of conservation measures have already been undertaken at this site, including:

- The site has been listed on the National Estate Register for its Natural Heritage Values.
- The site has been marked with significant native vegetation signs.
- The site has been burnt periodically over summer for the past 30 years as part of firebreak maintenance, which has helped reduce Kangaroo Grass dominance and maintained an open habitat favouring the persistence of small herbaceous species there.
- Negotiations with adjoining landholders has led to a reduction in stock movement along the road at Dundonnell, avoiding stock trampling and grazing on the roadside reserve.

Pterostylis sp. aff. *dolichochila* (Portland) Portland Long-tongue Shell Orchid

Description

The Portland Long-tongue Shell Orchid *Pterostylis* sp. aff. *dolichochila* is a small, terrestrial deciduous herb that is summer-dormant and emerges annually from a spherical subterranean tuber. Non-flowering plants produce a ground-hugging rosette of 4–9 small, narrowly ovate, pointed leaves to 12 mm long. Flowering plants lack a basal rosette and produce a slender stem to 20 cm tall, with a single translucent green and reddish-brown striped flower. The dorsal sepal and petals are united to form a galea 20 mm long, while the lateral sepals are erect, joined in the basal half, and ending in long fine free points that project well above the galea. The long, slender dark brown labellum projects just beyond the sinus when set (description from Jeanes & Backhouse 2006). Flowering occurs in July and August, and plants reproduce from seed as well as vegetatively.

Distribution

Pterostylis sp. aff. *dolichochila* is endemic to Victoria, where it is known from a single site near Portland in south-western Victoria, in the Naracoorte Coastal Plain IBRA bioregion (*sensu* DEH 2000) (Figure 14). Maps showing the distribution of *P.* sp. aff. *dolichochila* are available from the Department of Sustainability and Environment.

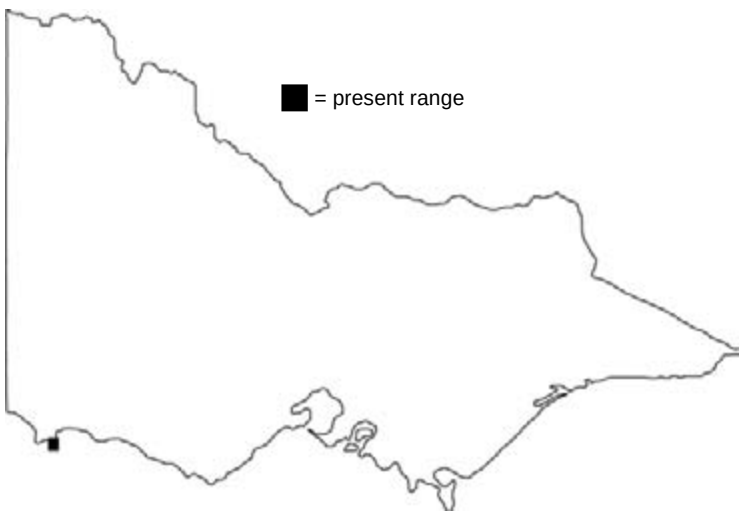

Figure 14. Distribution of *Pterostylis* sp. aff. *dolichochila*

Habitat

Pterostylis sp. aff. *dolichochila* occurs in coastal low Soap Mallee *Eucalyptus diversifolia* scrub with a sparse understorey of *Lomandra* species, *Viola* species, *Melaleuca lanceolata* and a variety of heath species, on well-drained, light grey calcareous sand. Plants generally occur in open, relatively bare areas between shrubs, often with a leaf litter groundcover. Recovery actions include survey and mapping of habitat that will lead to the identification of habitat critical to the survival of the species.

Population Details

Pterostylis sp. aff. *dolichochila* is known from a single population only containing about 200 plants, in the Cape Nelson Coastal Park, managed by Parks Victoria. Location details will generally be kept confidential to protect the orchid.

Decline and Threats

Nothing is known of the historical range or abundance of *P*. sp. aff. *dolichochila*. The single population faces a range of threats, including:

- Weed invasion, especially from Cape Ivy *Delairea odorata*, Boneseed *Chrysanthemoides monilifera*, Myrtle-Leaf Milkwort *Polygala myrtifolia* and Coast Wattle *Acacia longifolia*, all within the immediate vicinity of the population.
- Grazing by macropods wallabies and rabbits.
- Trampling and disturbance – the population is bisected by a walking track, and adjacent to the Cape Nelson Rd, as well as a large revegetation area, and therefore under threat from accidental trampling by walkers/enthusiasts, and accidental disturbance by park and roadside management activities.
- There is a high risk of extinction from stochastic events due to the small population size.

Pterostylis sp. aff. *mutica* (Basalt Plains) Leprechaun Greenhood

Description

The Leprechaun Greenhood *Pterostylis* sp. aff. *mutica* (Basalt Plains) is a small, deciduous herb that emerges annually from a spherical subterranean tuber. It produces a basal, stem-encircling, ground-hugging rosette of 2–12 ovate leaves to 8 mm long. The short (up to 12 cm tall), stout stem bears up to 12 small green flowers 8–10 mm high, in a crowded, overlapping spike. The dorsal sepal and petals are united to form a galea, while the lateral sepals are deflexed, cup-like and united for most of their length. The labellum is ovate and has a distinct greenish basal appendage that lacks prominent ridges. It is attached to the base of the column by a moveable claw that is triggered by a pollinator, propelling the labellum against the column. Flowering occurs from late September to early November (description from Jeanes & Backhouse 2006). Little is known of the biology and ecology of *P.* sp. aff. *mutica*. The pollinator is not known, although *Pterostylis* species are typically pollinated by small gnats, flies and mosquitoes (Jones 2006b). Plants reproduce solely from seed.

Distribution

Pterostylis sp. aff. *mutica* is endemic to Victoria, where it is known from a single location, near Dundonnel, in the Victorian Volcanic Plain IBRA bioregion (*sensu* DEH 2000) (Figure 15). Maps showing the distribution of *P.* sp. aff. *mutica* are available from the Department of Sustainability and Environment.

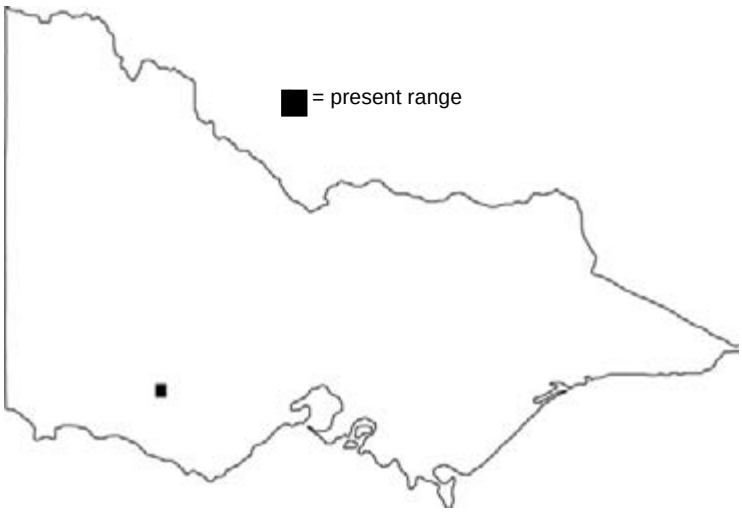

Figure 15. Distribution of *Pterostylis* sp. aff. *mutica*

Habitat

Pterostylis sp. aff. *mutica* occurs in Kangaroo Grass *Themeda triandra* grasslands on stony rises, with scattered *Acacia paradoxa* and other grasses including *Austrostipa* species, *Austrodanthonia* species and *Poa* species, and herbs including *Bulbine bulbosa* and *Chrysocephalum apiculatum*, on shallow heavy clay soils derived from basalt. Plants often grow in very shallow soils around embedded basalt boulders, often with mosses and small ferns present. Recovery actions include survey and mapping of habitat that will lead to the identification of habitat critical to the survival of the species.

Population Details

Pterostylis sp. aff. *mutica* is known from a single population of about 100 plants. It grows with *P.* sp. aff. *bicolor*, *P.* sp. aff. *cycnocephala* and *P. basaltica*. Location details will generally be kept confidential to protect the orchid.

Decline and Threats

The former distribution and abundance of *P.* sp. aff. *mutica* is not known, but it once probably occurred elsewhere in Victorian Volcanic Plain bioregion. The habitat in which the species grows is one of the most threatened in Australia. The Western (Basalt) Plains Grasslands once about 1 million ha of the Victorian Volcanic Plain bioregion, but has been reduced, largely through agricultural development, to about 0.15% of their original distribution (Craigie & Moorrees 2003). Now only a few thousand ha remain, in scattered, discontinuous fragments such as lightly grazed, unploughed, unfertilised paddocks and on small blocks of public land such as roadsides, rail reserves and cemeteries. These remnants continue to be degraded and lost.

The last remaining population of *P.* sp. aff. *mutica* faces a number of threats, including:

- Weed invasion, from annuals weeds and pasture grasses such as canary grass *Phalaris* species, fescue *Vulpia* species, quaking grass *Briza* species and wild oats *Avena* species.
- Grazing by stock (sheep) and introduced herbivores is a serious threat.
- Reduced fire frequency (or the absence of fire) would be detrimental to this species. Periodic fire prevents dense Kangaroo Grass swards from developing and swamping out other vegetation, especially herbs.
- Road maintenance works pose some risk. The continued cooperation of the Moyne Shire is necessary to reduce the risk of site disturbance resulting from road maintenance works.
- There is a very high risk of extinction due stochastic events because of the small population size.

Existing Conservation Measures

The Dundonnell site contains *P. basaltica*, which was the subject of a separate recovery plan (Ingeme & Backhouse 1999). As a result, a number of conservation measures have already been undertaken at this site, including:

- The site has been listed on the National Estate Register for its Natural Heritage Values.
- The site has been marked with significant native vegetation signs.
- The site has been burnt periodically over summer for the past 30 years as part of firebreak maintenance, which has helped reduce Kangaroo Grass dominance and maintained an open habitat favouring the persistence of small herbaceous species there.
- Negotiations with adjoining landholders has led to a reduction in stock movement along the road at Dundonnell, avoiding stock trampling and grazing on the roadside reserve.

Recovery Objectives and Actions

Recovery Objectives

The overall objective of recovery is to minimise the probability of extinction of each of the 15 threatened orchid species in the wild and to increase the probability of populations becoming self-sustaining in the long term. Within the duration of this Recovery Plan, the specific objectives for the recovery of the 15 threatened orchid species are to:

- Determine distribution, abundance and population structure
- Determine habitat requirements
- Ensure that all populations and their habitat are protected and managed
- Manage threats to populations
- Identify key biological functions
- Determine growth rates and viability of populations
- Establish a population in cultivation
- Establish new populations in the wild
- Build community support for conservation

Program Implementation and Evaluation

This Recovery Plan guides recovery actions for the 15 threatened orchid species and will be implemented and managed by the Department of Sustainability and Environment (for Victoria) and the Department for Environment and Heritage (for South Australia), supported by other agencies, educational institutions, regional natural resource management authorities and community groups as appropriate. Technical, scientific, habitat management or education components of the Recovery Plan will be referred to specialist groups on research, *in situ* management, community education and cultivation as required. Contact will be maintained between the State agencies on recovery issues concerning the threatened orchid species. The Recovery Plan will run for a maximum of five years from the date of its adoption under the EPBC Act, and will be reviewed and revised within five years of the date of its adoption.

Recovery Objectives, Actions and Performance Criteria

Action	Description	Species Targeted	Performance Criteria
Specific Objective 1: Determine distribution, abundance and population structure			
1.1	Undertake surveys to determine the area and extent of populations, the number, size and structure of populations, and inference or estimation of population change. **Responsibility: DSE, PV, DEH**	All 15 species	• For each species, at least five current population sites searched during flowering season (for species with <5 pops; all current population sites searched). • Sites mapped for population size, condition and habitat.
1.2	Determine taxonomy of all populations of undescribed species. **Responsibility: DSE, DEH, CPBR**	*Caladenia* sp. aff. *fragrantissima* *Caladenia* sp. aff. *rosella* *Corunastylis* sp. aff. *nudiscapa* *Corybas* sp. aff. *diemenicus* *Pterostylis* sp. aff. *bicolor* *Pterostylis* sp. aff. *cycnocephala* *Pterostylis* sp. aff. *dolichochila* *Pterostylis* sp. aff. *mutica*	• Taxonomy of all populations of undescribed species clarified.
Specific Objective 2: Determine habitat requirements			
2.1	Survey known habitat and collect floristic and environmental information relevant to community ecology and condition. **Responsibility: DSE, DEH**	• All 15 species	• Species/habitat specific survey design prepared. • Habitat critical to survival mapped for at least three populations for each species (for species with <3 pops; all current population sites mapped).
2.2	Identify and survey potential habitat, using ecological and bioclimatic information that may indicate habitat preference. **Responsibility: DSE, DEH**	• All 15 species	• Survey potential habitat at three sites for each species. • Predictive model for potential habitat developed & tested at two sites for each species.
Specific Objective 3: Ensure that all populations and their habitat are protected and managed appropriately			
3.1	Protect populations on public land. **Responsibility: DSE, DEH**	*Caladenia insularis* *Caladenia ornata* *Pterostylis cheraphila* *Pterostylis chlorogramma* *Pterostylis lustra* *Pterostylis* sp. aff. *bicolor* *Pterostylis* sp. aff. *cycnocephala* *Pterostylis* sp. aff. *mutica*	• Initiate a Public Authority Management Agreement (PAMA) for the quarry. • Initiate a Special Protection Zone (SPZ) for the Grampians, Roseneath, Meereek and Tallageira State Forest sites. • Initiate a SPZ for the Wail State Forest site. • Initiate a SPZ for the Mt. Clay, Mullundung and Tallageira State Forest sites. • Initiate a PAMA for the Lower Heytesbury and Princetown sites. • Initiate a PAMA for the Dundonnel site. • Initiate a PAMA for the Dundonnel site. • Initiate a PAMA for the Dundonnel site.
3.2	Protect populations on private land. **Responsibility: DSE, DEH**	*Caladenia* sp. aff. *rosella* *Corybas* sp. aff. *diemenicus* *Pterostylis* sp. aff. *bicolor* *Pterostylis chlorogramma* *Pterostylis lustra*	• Initiate private land management agreement at all private land sites.

Specific Objective 4: Manage threats to populations			
4.1	Control threats from pest plants. **Responsibility: DSE, PV, DEH**	All 15 species	• Measurable reduction in cover of weeds at and near all sites.
4.2	Control threats from pest animals. **Responsibility: DSE, PV, DEH**	All 15 species	• Measurable reduction in damage by pest animals at and near all sites.
4.3	Control the threat of direct damage by human activities. **Responsibility: DSE, PV, DEH**	All species **EXCEPT** *Caladenia* sp. aff. *rosella*	• Impact of human activities at all sites monitored and reduced (e.g. by signage, fencing) if required.
4.4	Manage microhabitat for seedling recruitment, collect seed and restock populations with seed. **Responsibility: DSE, DEH**	All species **EXCEPT** *Caladenia ornata* *Corybas* sp. aff. *diemenicus* *Pterostylis cheraphila* *Pterostylis chlorogramma* *Pterostylis lustra*	• Measurable increase in recruitment at three treated sites for each species (for species with <3 pops; all current population sites treated).
Specific Objective 5: Identify key biological functions			
5.1	Evaluate current reproductive status, seed bank status, longevity, fecundity and recruitment levels. **Responsibility: DSE, DEH**	All 15 species	• Reproductive ecology and regenerative potential quantified for three representative sites for each species (for species with <3 pops; all current populations evaluated). • Seed bank potential quantified for four representative sites.
5.2	Identify key stimuli for seed germination requirements. **Responsibility: DSE, DEH, RBG**	All 15 species	• Stimuli for recruitment identified. • Management strategies identified to maintain, enhance or restore processes fundamental to reproduction and survival.
5.3	Identify optimal fire regimes to maintain habitat. **Responsibility: DSE, PV**	*Caladenia cretacea* *Caladenia insularis* *Caladenia ornata* *Corunastylis* sp. aff. *nudiscapa*	• Preparation and implementation of management prescriptions for ecological burning at key population sites.
Specific Objective 6: Determine the growth rates and viability of populations			
6.1	Measure population trends and responses against recovery actions by collecting demographic information including recruitment and mortality, timing of life history stages and morphological data. **Responsibility: DSE, DEH**	All 15 species	• Techniques for monitoring developed and implemented. • Population growth rates determined and Population Viability Analysis completed for two populations of each species (**EXCEPT** for *Caladenia* sp. aff. *rosella*, *Caladenia* sp. aff. *fragrantissima*, *Corunastylis* sp. aff. *nudiscapa*, *Pterostylis* sp. aff. *cycnocephala* where remaining populations are too small to achieve this).
Specific Objective 7: Establish a population in cultivation			
7.1	Establish a seed bank and determine seed viability. **Responsibility: RBG**	All 15 species	• Seed from five populations in storage.
7.2	Establish plants in cultivation to safeguard against destruction of wild populations, provide a research population and potentially for reintroductions. **Responsibility: DSE, RBG, NOGN**	All species **EXCEPT** *Caladenia ornata* *Corybas* sp. aff. *diemenicus* *Pterostylis chlorogramma* *Pterostylis lustra*	• Development of effective propagation and cultivation techniques. • At least 50 healthy, genetically diverse, mature plants in cultivation.

Specific Objective 8: Establish new populations in the wild			
8.1	Select and evaluate potential reintroduction sites that are ecologically suitable, have secure land tenure and are managed appropriately. **Responsibility: DSE**	*Caladenia cretacea* *Caladenia insularis* *Caladenia* sp. aff. *fragrantissima* *Caladenia* sp. aff. *rosella* *Corunastylis* sp. aff. *nudiscapa* *Paracaleana disjuncta* *Pterostylis* sp. aff. *bicolor* *Pterostylis* sp. aff. *cycnocephala* *Pterostylis* sp. aff. *dolichochila* *Pterostylis* sp. aff. *mutica*	• Criteria for site suitability identified and site selected. • At least one translocation site identified and prepared for each species. • Translocation plan developed and approved.
8.2	Prepare site to achieve maximum survival of plants / germination of seed, using fungal baiting techniques. **Responsibility: DSE**	Species as above	• Successful fungal baiting, direct seeding, and translocation techniques developed.
8.3	Introduce and monitor plants from cultivation, or seed stock (sow seed and fungus mix directly into the field). **Responsibility: DSE**	Species as above	• Measurable increase in population size at the site.
Specific Objective 9: Build community support for conservation			
9.1	Identify opportunities for community involvement in the conservation of the 15 threatened orchid species. **Responsibility: DSE, PV, DEH**	All 15 species	Community nature conservation and Landcare groups aware of the species and support its conservation.

Abbreviations: ANOS – Australasian Native Orchid Society (Victorian Group); CPBR – Centre for Plant Biodiversity Research Biology, Canberra; DEH – Department for Environment and Heritage (SA); DSE – Department of Sustainability and Environment (Victoria); NOGN – Native Orchid Growers Network; PV – Parks Victoria; RBG – Royal Botanic Gardens, Melbourne

Affected Interests

The 15 threatened orchid species occur across a variety of land tenures including parks and reserves, other public land and private property. Consequently, their management is the responsibility of a range of organisations and individuals (Table 8). In particular, conservation of those species on private land will require sympathetic management from private landowners. The Recovery Plan has the support of government agencies, statutory authorities and community groups involved in orchid conservation in Victoria and South Australia, who will assist in the management and monitoring of each species. Two community groups – the Australasian Native Orchid Society (Victorian Group) and the Native Orchid Society of South Australia – have played a key role in conservation of threatened orchids and will continue to be involved in recovery actions for these 15 orchid species.

Table 8. Organisations with a direct interest in the conservation of the 15 threatened orchid species

Species	Management Interest
Caladenia cretacea	Department of Sustainability & Environment (Vic) Parks Victoria
Caladenia insularis	Department of Sustainability & Environment (Vic) Parks Victoria
Caladenia ornata	Department of Sustainability & Environment (Vic) Parks Victoria Department for Environment and Heritage (SA)
Caladenia sp. aff. *fragrantissima* (Central Victoria)	Department of Sustainability & Environment (Vic) Parks Victoria
Caladenia sp. aff. *rosella* (Violet Town)	Department of Sustainability & Environment (Vic) landowner
Corunastylis sp. aff. *nudiscapa* (Otway Ranges)	Department of Sustainability & Environment (Vic) Parks Victoria
Corybas sp. aff. *diemenicus* (Coastal)	Department of Sustainability & Environment (Vic) Parks Victoria Department for Environment and Heritage (SA) landowners
Paracaleana disjuncta	Department of Sustainability & Environment (Vic) Parks Victoria Department for Environment and Heritage (SA)
Pterostylis cheraphila	Department of Sustainability & Environment (Vic) Parks Victoria West Wimmera Shire
Pterostylis chlorogramma	Department of Sustainability & Environment (Vic) Parks Victoria landowners
Pterostylis lustra	Department of Sustainability & Environment (Vic) Parks Victoria Department for Environment and Heritage (SA) landowners
Pterostylis sp. aff. *bicolor* (Woorndoo)	Department of Sustainability & Environment (Vic) Moyne Shire landowner
Pterostylis sp. aff. *cycnocephala* (Woorndoo)	Department of Sustainability & Environment (Vic) Moyne Shire
Pterostylis sp. aff. *dolichochila* (Portland)	Department of Sustainability & Environment (Vic) Parks Victoria
Pterostylis sp. aff. *mutica* (Basalt Plains)	Department of Sustainability & Environment (Vic) Moyne Shire

Role and Interests of Indigenous People

Indigenous cR'*%mmunities on whose traditional lands the threatened orchids occur are being advised, through the relevant Regional Indigenous Facilitator, of the preparation of this Recovery Plan and. Opportunities to involve indigenous communities in the implementation of the Recovery Plan will be explored once it is finalised.

Biodiversity Benefits

The recovery plan includes a number of potential biodiversity benefits for other species and vegetation communities in Victoria. Principally, this will be through the protection and management of habitat. The adoption of broad-scale management techniques and collection of baseline data will also benefit a number of other plant species growing in association with each threatened orchid species, particularly those species with similar life forms and/or flowering responses. The recovery plan will also provide an important public education role as orchids have the potential to act as 'flagship species' for highlighting broader nature conservation and biodiversity issues such as land clearing, grazing, weed invasions and habitat degradation. Germination and cultivation techniques developed during the recovery phase will be of use for other threatened orchids elsewhere in southeast Australia, while the requirement to recover taxa across state boundaries will better develop working relationships between state departments on a broader range of biodiversity conservation issues.

Several of the species covered in this Recovery Plan grow together at some sites. *Pterostylis* sp. aff. *bicolor*, *P.* sp. aff. *cycnocephala* and *P.* sp. aff. *mutica* all grow together at the Dundonnell site, together with *P. basaltica*, the subject of a separate recovery plan (Ingeme & Backhouse 1999). *Corybas* sp. aff. *diemenicus* grows with *P. lustra* and another threatened orchid, *Pterostylis tenuissima* (Craig & Pritchard 2001) at several sites. Recovery actions implemented at these sites will benefit several orchids, as well as other threatened species in threatened habitats such as the Western (Basalt) Plains grasslands.

Social and Economic Impacts

The implementation of this recovery plan is unlikely to cause significant adverse social and economic impacts. Many populations of the 15 threatened orchids occur on public land, either crown land reserved for various public purposes, or on road reserves, managed by a variety of local and State government agencies. Any protection measures required at these sites (e.g. fencing, signage, track closures) will have minimal impact on current recreational and commercial activities. Protection of these populations has been negotiated with the relevant land manager. Protection of the populations on private land or on land managed by other authorities will be achieved through voluntary agreements with landowners and managers, supported by incentives where available.

Management Practices

The philosophy of the strategy for recovery is habitat conservation, restoration and management, combined with an understanding of the ecological and biological requirements of the threatened orchids necessary for specific population management. The emphasis is on using knowledge to better implement *in situ* management techniques that protect populations and promote regeneration and recruitment. To achieve this, recovery actions are structured to acquire baseline data, assess habitat condition, including ecological and biological function, and maintain or improve population growth through protection and management.

On-ground site management will aim to mitigate threatening processes and thereby insure against extinction. Major threats requiring management include accidental destruction, competition from pest plants, inappropriate fire regimes and grazing by pest animals. A range of strategies will be necessary to mitigate these threats including weed control, caging / fencing, control of pest animals, and fire management. Broadscale protection measures applicable to all populations include legal protection of sites, habitat retention and liaison with land managers and private landholders. In addition, searches of known and potential habitat should continue to better define the distributions and size of populations.

The recovery plan also advocates strategies to fill some of the major gaps in our knowledge to date. These include an understanding of seed bank dynamics and recruitment. Successful *in*

situ population management will be founded on understanding the obligate relationships between the species and associated flora, as well as its response to environmental processes. These are directly linked to seed production, recruitment and regeneration and are thus vital to recovery. Demographic censusing will be necessary to gather life history information and to monitor the success of particular management actions. In addition to the above, *ex situ* conservation measures will be required and will include seed storage and plant cultivation. Cultivating *ex situ* populations will also aim to increase the amount of seed available for reintroduction to sites. Several species will require the establishment of new populations to ensure their survival. Community participation in recovery actions will be sought, particularly in regard to recovery team membership and implementation of on-ground works

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References

Backhouse, G.N. and Jeanes, J.A. 1995. *The Orchids of Victoria*. The Meigunyah Press, Carlton.

Bishop, T. 1996. *Field Guide to the Orchids of New South Wales and Victoria.* University of New South Wales Press, Sydney.

Carr, G.W. 1991. New taxa in *Caladenia* R.Br., *Chiloglottis* R.Br. and *Gastrodia* R.Br (Orchidaceae) from southeastern Australia. *IFFA Miscellaneous Paper* 1: 1–25.

Coates, F., Jeanes, J. and Pritchard, A. 2002. *Recovery Plan for Twenty-five Threatened Orchid Taxa of Victoria, South Australia and New South Wales*. Department of Natural Resources and Environment, Victoria.

Craig, A. and Pritchard, A. (2001) *Recovery Plans for Three Species of Orchid in Southeast South Australia and Southwest Victoria: Caladenia richardsiorum (Little Dip Spider Orchid), Caladenia calcicola (Limestone Spider Orchid), and Pterostylis tenuissima (Swamp Greenhood) for 2001-2005.* National Parks and Wildlife, South Australia and Department of Natural Resources and Environment, Victoria.

DEH 2000. *Revision of the Interim Biogeographic Regionalisation of Australia (IBRA) and the Development of Version 5.1. - Summary Report.* Department of Environment and Heritage, Canberra.

Ingeme, Y. and Backhouse, G. 1999. Basalt Greenhood (*Pterostylis basaltica*) Recovery Plan 2000-2004. Department of Natural Resources and Environment, Victoria.

Jeanes, J.A. and Backhouse, G.N. 2006. *Wild Orchids of Victoria*, *Australia*. Aquatic Photographics, Seaford.

Jones, D.L. 2000. Four new names in *Caladenia* R.Br. (Orchidaceae) and a note on *C. carnea* var. *subulata* Nicholls. *Orchadian* 13(6): 255–257.

Jones, D.L. 2003. *Paracaleana disjuncta*, a threatened new species from Victoria and South Australia. *Orchadian* 14(5): 226–229.

Jones, D.L. 2006a. Miscellaneous New Species of Australian Orchidaceae *Australian Orchid Research* 5(2006): 45–111.

Jones, D.L. 2006b. *A Complete Guide to Native Orchids of Australia*. Reed New Holland, Sydney.

Jones, D.L. and Clements, M.A. (1993). New species of *Pterostylis* R. Br. (Orchidaceae) from Victoria and New South Wales. *Muelleria* 8(1): 73–83.

Muir, A. M., Edwards, S. A., and Dickins, J. M. 1995. *Description and Conservation Status of the Vegetation of the Box-Ironbark Ecosystem in Victoria.* Flora and Fauna Technical Report No. 136. Department of Natural Resources and Environment, Victoria.

Nicholls, W.H. 1945. Orchid Notes. *Victorian Naturalist* 62: 61–63.

Nicholls, W.H. 1969. *Orchids of Australia* (eds. D.L. Jones & T.B. Muir) Plate 337a & b. Thomas Nelson, Melbourne, Victoria.

NOSSA 2007. *Orchids of South Australia electronic edition* (ed. R.J. Bates). Native Orchid Society of South Australia, Adelaide.

Ross, J.H. and Walsh, N.G. 2003 *A Census of the Vascular Plants of Victoria*. Seventh Edition. Royal Botanic Gardens, South Yarra.

Priority, Feasibility and Estimated Costs of Recovery Actions

Action	*Description*	*Priority*	*Feasibility*	*Responsibility*	*Cost estimate*					
					Year 1	Year 2	Year 3	Year 4	Year 5	Total
1	**Distribution, abundance**									
1.1	Surveys	1	100%	DSE, DECC	$30,000	$30,000	$30,000	$30,000	$30,000	$150,000
1.2	Taxonomy	2	100%	DSE, DECC, CPBR	$10,000	$10,000	$10,000	$0	$0	$30,000
2	**Habitat requirements**									
2.1	Known habitat	1	100%	DSE, DECC	$50,000	$50,000	$0	$0	$0	$100,000
2.2	Potential habitat	2	75%	DSE, DECC	$0	$0	$30,000	$30,000	$0	$60,000
3	**Habitat protection**									
3.1	Public land	1	100%	DSE	$0	$0	$15,000	$15,000	$15,000	$45,000
3.2	Private land	1	100%	DECC	$15,000	$15,000	$15,000	$0	$0	$45,000
4	**Threat management**									
4.1	Pest plants	1	90%	DSE, PV, DECC	$50,000	$50,000	$50,000	$50,000	$50,000	$250,000
4.2	Pest animals	1	90%	DSE, PV, DECC	$30,000	$30,000	$30,000	$30,000	$30,000	$150,000
4.3	Human damage	1	90%	DSE, PV, DECC	$20,000	$20,000	$20,000	$20,000	$20,000	$100,000
4.4	Seedling recruitment	1	75%	DSE, DECC	$30,000	$30,000	$30,000	$30,000	$30,000	$150,000
5	**Biological functions**									
5.1	Reproductive status	2	75%	DSE, PV, DECC	$0	$25,000	$25,000	$25,000	$0	$75,000
5.2	Seed germination	2	100%	DSE, DECC, RBG	$0	$0	$25,000	$25,000	$25,000	$75,000
5.3	Fire regimes	1	75%	DSE, PV, DECC	$0	$30,000	$50,000	$50,000	$50,000	$180,000
6	**Population viability**									
6.1	Censusing	1	100%	DSE, DECC	$50,000	$50,000	$50,000	$50,000	$50,000	$250,000
7	**Cultivation**									
7.1	Cultivated plants	2	75%	DSE, RBG, NOGN	$15,000	$15,000	$15,000	$15,000	$15,000	$75,000
7.2	Seed bank	2	100%	RBG	$0	$0	$10,000	$10,000	$15,000	$35,000
8	**New populations**									
8.1	Site selection	2	75%	DSE, RBG, NOGN	$0	$25,000	$25,000	$0	$0	$50,000
8.2	Site preparation	2	100%	DSE, DECC, RBG	$0	$0	$20,000	$20,000	$0	$15,000
8.3	Reintroduction	2	100%	RBG	$0	$0	$0	$25,000	$25,000	$50,000
8	**Community support**									
8.1	Community extension	3	100%	DSE, PV, DECC	$10,000	$10,000	$10,000	$10,000	$10,000	$50,000
				TOTALS	$310,000	$390,000	$460,000	$435,000	$365,000	$1,935,000