

INTERIM RECOVERY PLAN NO. 181

# **BLUE BABE-IN-THE-CRADLE ORCHID**

## **(*EPIBLEMA GRANDIFLORUM* VAR. *CYANEUM* MS)**

### **INTERIM RECOVERY PLAN**

**2004-2009**

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Photograph: Andrew Brown

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## FOREWORD

Interim Recovery Plans (IRPs) are developed within the framework laid down in Department of Conservation and Land Management (CALM) Policy Statements Nos. 44 and 50.

IRPs outline the recovery actions that are required to urgently address those threatening processes most affecting the ongoing survival of threatened taxa or ecological communities, and begin the recovery process.

CALM is committed to ensuring that Critically Endangered taxa are conserved through the preparation and implementation of Recovery Plans or Interim Recovery Plans and by ensuring that conservation action commences as soon as possible and always within one year of endorsement of that rank by the Minister.

This Interim Recovery Plan replaces plan number 69 - Blue Babe-in-the-Cradle Orchid (*Epiblema grandiflorum* var. *cyaneum* ms) (G. Stack *et al.* 2000).

This Interim Recovery Plan will operate from July 2004 to June 2009 but will remain in force until withdrawn or replaced. It is intended that, if the taxon is still ranked Critically Endangered, this IRP will be reviewed after five years and the need for a full Recovery Plan will be assessed.

This IRP was given regional approval on 15 September, 2004 and was approved by the Director of Nature Conservation on 24 September, 2004. The allocation of staff time and provision of funds identified in this Interim Recovery Plan is dependent on budgetary and other constraints affecting CALM, as well as the need to address other priorities.

Information in this IRP was accurate at July 2004.

## ACKNOWLEDGMENTS

The following people have provided assistance and advice in the preparation of this Interim Recovery Plan:

Andrew Batty	Research Scientist, Botanic Garden and Parks Authority
Kingsley Dixon	Assistant Director, Botanic Garden and Parks Authority
Rebecca Evans	Conservation Officer, CALM's Swan Region
David Mitchell	Regional Leader Nature Conservation, CALM's Swan Region
Leigh Sage	Conservation Officer, CALM's Swan Coastal District

Thanks also to staff of the W.A. Herbarium for providing access to Herbarium databases and specimen information, and CALM's Wildlife Branch for assistance.

## SUMMARY

<b>Scientific Name:</b>	<i>Epiblema grandiflorum</i> var. <i>cyaneum</i> K.W.Dixon ms	<b>Common Name:</b>	Blue Babe-in-the-Cradle Orchid
<b>Family:</b>	Orchidaceae	<b>Flowering Period:</b>	Late November to January
<b>CALM Region:</b>	Swan	<b>CALM District:</b>	Swan Coastal
<b>Shire:</b>	Swan	<b>Recovery Team:</b>	Swan Region Threatened Flora and Communities Recovery Team

**Illustrations and/or further information:** Brown, A., Thomson-Dans, C. and Marchant, N. (Eds). (1998) *Western Australia's Threatened Flora*. Department of Conservation and Land Management, Western Australia; Hoffman, N. and Brown, A. (1998) *Orchids of South West Australia*. Revised 2<sup>nd</sup> Edition with supplement. University of Western Australia Press, Nedlands; Western Australian Herbarium (1998) FloraBase - Information on the Western Australian Flora. Department of Conservation and Land Management, Western Australia. <http://www.calm.wa.gov.au/science/>.

**Current status:** *Epiblema grandiflorum* var. *cyaneum* ms was declared as Rare Flora in May 1991, under the Western Australian *Wildlife Conservation Act* 1950 and ranked as Critically Endangered (CR) in February 1997. The taxon is also listed as Endangered under the Commonwealth *Environmental Protection and Biodiversity Conservation Act* 1999 (EPBC Act). It currently meets World Conservation Union (IUCN 2000) Red List Category 'CR' under criteria A4a; B1ab(v)+B2ab(v); C2a(i,ii) and D as it is only known from a single population comprised of less than 50 mature individuals, with continued decline in the quality of the habitat. The main threats are altered water quality and quantity, inappropriate fire regimes, weed invasion, increased visitor usage of the reserve in which the orchid occurs, insect predation of the capsule, and dieback disease.

**Critical habitat:** The critical habitat for *Epiblema grandiflorum* var. *cyaneum* ms comprises the area of occupancy of the known population; similar habitat within 200 metres of the known population; additional nearby occurrences of similar habitat that do not currently contain the taxon but may have done so in the past and may be suitable for translocations; and the local catchment for the surface and groundwaters that provide the winter-wet habitat of the taxon.

**Habitat critical to the survival of the species, and important populations:** Given that this taxon is listed as Declared Rare Flora it is considered that all known habitat for wild and translocated populations is habitat critical.

**Benefits to other species/ecological communities:** Recovery actions implemented to improve the quality or security of the habitat of *Epiblema grandiflorum* var. *cyaneum* ms will also improve the status of remnant vegetation in which it is located.

**International Obligations:** This plan is fully consistent with the aims and recommendations of the Convention on Biological Diversity, ratified by Australia in June 1993, and will assist in implementing Australia's responsibilities under that Convention. The taxon is also specifically listed under the United Nations Environment Programme World Conservation Monitoring Centre Convention on International Trade in Endangered Species.

**Role and interests of indigenous people:** According to the Department of Indigenous Affairs Aboriginal Heritage Sites Register, no sites have been discovered near the *Epiblema grandiflorum* var. *cyaneum* ms population. Input and involvement will be sought from any indigenous groups that have an active interest in the areas that are habitat for *E. grandiflorum* var. *cyaneum* ms, and this is discussed in the recovery actions.

**Social and economic impacts:** The implementation of this recovery plan is unlikely to have any major social and economic impact. as the only known population is located in a reserve managed for conservation.

**Evaluation of the Plans Performance:** CALM, in conjunction with the Recovery Team will evaluate the performance of this IRP. The plan is to be reviewed within five years of its implementation.

**Habitat requirements:** *Epiblema grandiflorum* var. *cyaneum* ms is only known from a single population that occurs in a small Nature Reserve near Perth. It occurs on grey peaty sands in amongst dense sedges under *Melaleuca preissii* in a winter-wet swamp. The plants flower as the water level begins to fall in the wetland area in late spring.

**Existing Recovery Actions:** The following recovery actions have been or are currently being implemented:

1. Land managers have been notified of the location and threatened status of the taxon.
2. A drainage system with a gate has been installed to regulate the flow of water into and out of the swamp where this taxon occurs.

3. The groundwater level near the wetland in which Population 1 occurs is monitored regularly by the Water and Rivers Commission.
4. A cyclone fence was installed around the swamp habitat of this taxon in late 1996 to maintain the security of the population and prevent accidental damage. A pine bollard fence was erected at the same time around the perimeter of the public open space that surrounds the orchid habitat on three sides.
5. The area in which the orchid occurs was declared a Nature Reserve in 1998.
6. Trees have been planted on the northern, western and southern side of the orchid habitat to combat predicted changes in hydrology.
7. A fire management strategy has been developed for the taxon's habitat by CALM's Swan Coastal District.
8. An article promoting public awareness of the *Epiblema grandiflorum* var. *cyaneum* ms appeared in the West Australian newspaper on 5 January 2001.
9. The Bennet Brook Catchment Group was successful in gaining Threatened Species Network funds in 2002 for habitat restoration.
10. Staff of the Botanic Garden and Parks Authority (BGPA) and The University of Western Australia are currently researching the taxons' biology and ecology, including germination and propagation methods.
11. Two capsules of seed were collected from a single plant that flowered in 1999. This is in cryostorage at the BGPA.
12. The Swan Region Threatened Flora Recovery Team (SRTFCRT) is overseeing the implementation of this IRP.
13. Staff from CALM's Swan Coastal District regularly monitor the population of this taxon.

**IRP Objective:** The objective of this Interim Recovery Plan is to abate identified threats and maintain or enhance *in situ* populations to ensure the long-term preservation of the taxon in the wild.

#### **Recovery criteria**

##### **Criteria for success:**

- Confirmation that plants of *Epiblema grandiflorum* var. *cyaneum* ms continue to occur in Population 1, or there is an increase in the number of plants recorded during the period of this plan.
- New population/s of this taxon are discovered and protected.
- There is successful development of methods of *ex situ* germplasm collection and propagation (including a 'living collection' of this taxon).

##### **Criteria for failure:**

- No plants of *Epiblema grandiflorum* var. *cyaneum* ms are recorded in Population 1 during the period of this plan.
- Development of methods of *ex situ* germplasm collection and propagation is unsuccessful.

#### **Recovery actions**

1. Coordinate recovery actions.
2. Map critical habitat.
3. Monitor water levels and quality.
4. Evaluate taxonomy.
5. Implement fire management strategy.
6. Maintain access restrictions.
7. Collect seed and fungi.
8. Undertake weed control.
9. Monitor population.
10. Implement dieback hygiene.
11. Conduct further surveys.
12. Obtain biological and ecological information.
13. Promote awareness.
14. Develop a translocation proposal.
15. Review the need for a full Recovery Plan.

## 1. BACKGROUND

### History

The first known collection of *Epiblema grandiflorum* var. *cyaneum* ms, was made in 1987 by Dr Kingsley Dixon. This single known population occurs with *Epiblema grandiflorum* var. *grandiflorum*, on a Nature Reserve near Perth. *E. grandiflorum* var. *cyaneum* ms was previously recorded from two populations but it is now thought that a population reported to occur near Walpole is not a true representative of this variety.

In 1987 and 1988 about 200 non-flowering and six flowering plants were recorded in the known population. The non-flowering specimens were identified only from leaves and a proportion of these may have been *Epiblema grandiflorum* var. *grandiflorum*. The area had been burnt both of these years, and field observations noted that the site was permanently wet. Twenty nine plants were recorded in 1990 to 1992.

In 1995/1996 a flood was recorded in the wetland at the site. This flood may have contributed to alterations in the hydrology of the area. Despite extensive searches of the swamp in subsequent years (1996, 1997 and 1998) no flowering plants were recorded.

In 1999, the Orchid Society and Study Group and a scientist from The University of Western Australia (UWA) located one flowering plant of the taxon in flower. The UWA scientist collected seed from this plant later that year. In some years, no plants have been recorded in the only known population, but plants have then been located in subsequent years. No plants were recorded in the latest monitoring period (2002), but the habitat is healthy and it is presumed that propagules still exist in the soil.

There have been numerous alterations to the hydrology in the area associated with floods, roadworks, development of land surrounding the population, and with drainage works for the general area. Negotiations with the then owner of the land on which the population occurs resulted in the area being declared a Nature Reserve in 1998 and the site is now under the care, control and management of the Conservation Commission of Western Australia, and is managed by the Department of Conservation and Land Management. The previous landowner fenced the entire swamp to protect the population from accidental damage. The surrounding area has been progressively developed for housing.

### Description

Within the genus *Epiblema*, there is only one species, containing two varieties, and these are both endemic to the south west of Western Australia. The more common babe-in-a-cradle orchid (*Epiblema grandiflorum* var. *grandiflorum*) occurs in peaty swamps along the coastal plain between Gingin and Esperance. The only difference between the two varieties is that *E. grandiflorum* var. *cyaneum* ms has pale blue flowers instead of purple to mauve flowers.

The common name for *Epiblema grandiflorum* originates from a story told to Rika Erikson by a child with whom she was bushwalking. The child told her “we always call it Babe-in-a-Cradle Orchid because you see him kicking off the rug” (Erickson 1978).

*Epiblema grandiflorum* var. *cyaneum* ms flowers in late November to January. Plants are between 25 and 80 cm in height. It has a slender, erect stem with a basal, narrowly rounded leaf 20-25 cm long and two shorter, erect stem bracts. There are usually up to six stalked flowers in a loose inflorescence. Each flower is 2-4 cm in diameter. The spreading sepals and lateral petals are almost equal in size. The labellum (lip) is egg-shaped with a distinct claw and a tuft of linear calli (glands) at the base. The column is short with thin, erect lobes. The main distinguishing features of the

flower are the cluster of ribbon-like appendages at the base of the labellum and the broadly-winged column (Hoffman and Brown 1998).

There are no known collections of *E. grandiflorum* var. *cyaneum* ms at the WA Herbarium and a full taxonomic description has not been written for this taxon.

### **Distribution and habitat**

The specific habitat requirements of *Epiblema grandiflorum* var. *cyaneum* ms are not well studied, but are believed to be similar to those of the more common variety *E. grandiflorum* var. *grandiflorum*. The latter variant requires a very specific hydrological regime to survive and flower, and is only found in wetlands with that particular regime. *E. grandiflorum* var. *cyaneum* ms is endemic to Western Australia. It is apparently confined to a single swamp in the Perth Metropolitan area and is known from only one population. The plants grow amongst dense sedges and *Astartea fascicularis* under *Melaleuca preissiana* and *M. raphiophylla* bordering a winter-wet swamp. The soils at the known population are grey sands overlying pebbly silts. Groundwater moves beneath the site and fluctuates about 1m in depth between summer and winter. The winter rise in groundwater results in the inundation of the site in winter.

*Epiblema grandiflorum* var. *cyaneum* ms appears to require a water depth of 10-20 cm during spring to initiate flowering, followed by drying out during summer. The water level is determined by groundwater, surface water inflow (from another nearby wetland and a main drain), and from surface outflows to the same main drain. Since 1963 all surface flows have been artificial as a result of drainage works in the general area. A road culvert near the site probably limits maximum water levels, but not the minimum levels of the wetland.

Urban development in the immediate area of the wetland in which *Epiblema grandiflorum* var. *cyaneum* ms occurs was predicted to cause an increase in the height of the local watertable peaking five years after the development that occurred in 1995-1996. It was predicted that this would be followed by a fall in groundwater levels, possibly even to below the original height, as a consequence of abstraction of water from private bores. This does not, however, impact on water levels in the orchid's habitat, as water levels are monitored and controlled at this site.

### **Habitat critical to the survival of the species, and important populations**

Given that this taxon is listed as Declared Rare Flora it is considered that all known habitat is habitat critical. In addition all populations, including future translocated populations, are considered important to the survival of the taxon. Recovery actions include survey for further populations that may lead to the identification of additional habitat critical.

### **Benefits to other species/ecological communities**

Recovery actions implemented to improve the quality or security of the habitat of *Epiblema grandiflorum* var. *cyaneum* ms will also help to improve the status of remnant vegetation in which it is located.

### **International Obligations**

This plan is fully consistent with the aims and recommendations of the Convention on Biological Diversity, ratified by Australia in June 1993, and will assist in implementing Australia's responsibilities under that Convention. The taxon is also specifically listed under the United Nations Environment Programme World Conservation Monitoring Centre Convention on International Trade in Endangered Species.

## **Role and interests of indigenous people**

According to the Department of Indigenous Affairs Aboriginal Heritage Sites Register, no sites have been discovered near the *Epiblema grandiflorum* var. *cyaneum* ms population. Input and involvement will be sought from any indigenous groups that have an active interest in the areas that are habitat for *E. grandiflorum* var. *cyaneum* ms, and this is discussed in the recovery actions.

## **Social and economic impacts**

The implementation of this recovery plan is unlikely to have any major social or economic impacts, as the only known population is located in a reserve managed for conservation.

## **Evaluation of the Plan's Performance**

CALM, in conjunction with the Swan Region Threatened Flora and Communities Recovery Team will evaluate the performance of this Interim Recovery Plan. The plan is to be reviewed within five years of its implementation. Any changes to management or recovery actions will be documented accordingly.

## **Critical habitat**

Critical habitat is habitat identified as being critical to the survival of a listed threatened species or listed threatened ecological community. Habitat is defined as the biophysical medium or media occupied (continuously, periodically or occasionally) by an organism or group of organisms or once occupied (continuously, periodically or occasionally) by an organism, or group of organisms, and into which organisms of that kind have the potential to be reintroduced (*Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)).

The critical habitat for *Epiblema grandiflorum* var. *cyaneum* ms comprises:

- the area of occupancy of the known population;
- areas that have shallow surface water during spring, followed by drying out during summer, with dense sedges and *Astartea fascicularis* under *Melaleuca preissiana* and *M. raphiophylla* within 200 metres of the known population (these provide potential habitat for natural range extension);
- remnant vegetation that surrounds the population (this is necessary to allow pollinators to move);
- additional occurrences of similar habitat that do not currently contain the taxon but may have done so in the past (these represent possible translocation sites); and
- the local catchment for the surface and groundwaters that provide the winter-wet habitat of the taxon (the taxon occurs in seasonally inundated areas and whose occurrence depends on the maintenance of local hydrology).

## **Biology and ecology**

It is thought (personal communication K. Dixon<sup>1</sup>) that this taxon can grow and flower in areas that have been recently burnt, but it can also flower in the absence of fire. In 1999, a plant flowered following 10 years in which the habitat had not been burnt.

It is not known what pollinates this taxon or the requirements for germination. It is known however, that *Epiblema grandiflorum* var. *cyaneum* ms requires a particular mycorrhizal fungus for germination and growth. The plants and the fungus are likely to be very vulnerable to physical disturbance, altered fire regimes, and declining water quality or altered hydrology (Brown and Dixon 2001).

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<sup>1</sup> Dr Kingsley Dixon - Assistant Director (Plant Science) BGPA

Some seed of *Epiblema grandiflorum* var. *cyaneum* ms has now been collected by the Botanic Gardens and Parks Authority (BGPA) but endophytic material isolated to date has failed to germinate seed. Further research is required to determine why no germination has occurred. It is possible that seed may have complex dormancy mechanisms that prevent initial germination. Standard tests have been carried out but have not broken seed dormancy.

Field evidence indicates several limiting factors in reproduction; lack of flowering mechanisms, limited seed set, and predation of seed capsules. Hand pollination may be required to promote a higher seed set. Developing seed capsules are prone to predation by invertebrates and may require protection. Collection of immature flower buds of the common variety have been initiated into tissue culture, and may be a viable means for producing individuals for translocation. This would require further research (pers comm. Andrew Batty<sup>1</sup>).

## Threats

*Epiblema grandiflorum* var. *cyaneum* ms was declared as Rare Flora in May 1991 under the Western Australian *Wildlife Conservation Act* 1950 and ranked as Critically Endangered (CR) in February 1997. The taxon is also listed as Endangered under the EPBC Act. It currently meets World Conservation Union (IUCN 2000) Red List Category 'CR' under criteria A4a; B1ab(v)+B2ab(v); C2a(i,ii) and D due to the restricted distribution, and declining population size and quality of the habitat. The scarcity of this orchid is probably due to the inherent rarity of this variant coupled with the very specific habitat requirements, and the level of clearing and drainage of wetlands that has occurred for urban development and agricultural purposes. There has been a continuing decline in the size of the known population for around 10 years.

The main threats to *Epiblema grandiflorum* var. *cyaneum* ms are altered water quality and quantity, inappropriate fire regimes, weed invasion, increased visitor usage of the reserve in which the orchid occurs, insect predation of the capsule, and possibly the impacts of dieback disease caused by the plant pathogen *Phytophthora* spp. on the habitat.

- **An altered hydrological regime** is likely to result from the development of a housing estate, drains, and roads around the orchid habitat. Flooding of the area that occurred in 1995/1996 may be linked to altered hydrology.
- **Pollution of the groundwater** from local sources such as herbicide and fertiliser applications from nearby housing lots, and other chemicals from runoff from roads may affect the taxons' growth and survival. The diversion of a major drain that flowed into the area and design of the drainage system within the adjoining urban area have largely addressed the threat of water quality deterioration. However threats still exist from the use of herbicides and fertilisers in the immediate vicinity of the reserve, particularly in the adjoining public open space which includes lawn areas.
- **Inappropriate fire regimes** would adversely affect the viability of populations, as seeds of *Epiblema grandiflorum* var. *cyaneum* ms probably germinate following fire. It is likely that occasional fires are needed for reproduction of this taxon. The timing and frequency of fire is crucial in the management of orchid species. It is important to exclude fire during the vegetative and flowering phases (June to December) as fire at this time prevents seed formation, and kills the plants. Autumn burns are likely to be the most appropriate to sustain or increase populations of this orchid, although fire in the very dense habitat is likely to be more difficult to control at that time of year. The proximity of urban development is likely to result in increased fire frequency in the area.
- **Weed invasion** and invasion by other local species may be a threat to this orchid in future. Local dryland or aquatic species may invade the site if hydrology of the site is sufficiently

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<sup>1</sup> Dr Andrew Batty, Research Scientist, BGPA



altered. Weeds such as *Typha orientalis* (Asian Bulrush) may encroach on the site, even in the absence of altered hydrology. Grassy weed species may also encroach on the site in response to increased disturbance associated with urban development and road maintenance on adjacent lands. Weeds suppress early plant growth by competing for soil moisture, nutrients and light.

- **Trampling and general disturbance of the habitat** including deliberate vandalism are a serious threat to this orchid, as it occurs immediately adjacent to urban development. A high fence has been erected around the area to help overcome this problem.
- **Insect predation** on the capsule may be a threat to the survival of this taxon. Given that only one flowering specimen has been located in recent years, insects may totally destroy reproductive potential.
- **Dieback disease** caused by the plant pathogen *Phytophthora cinnamomi* does not generally impact orchid species, although susceptibility of *Epiblema grandiflorum* var. *cyaneum* ms to the disease is not known. However, the disease can indirectly impact orchids by altering habitat. For example, the disease can result in a reduction in canopy cover which may disadvantage a taxon that requires high levels of cover.

#### Summary of population information and threats

Pop. No. & Location	Land Status	Year/No. plants	Condition	Threats
1. Malaga	Nature Reserve	1987 (200) 1988 6(200) 1992 29 1996 0 1997 0 1999 1 2000 2 2002 0	Habitat in good condition	Altered hydrology, pollution, inappropriate fire regimes, weeds, trampling, insect predation, dieback disease

Numbers in brackets = number of seedlings and may include plants of *Epiblema grandiflorum* var. *grandiflorum*.

#### Guide for decision-makers

Section 1 provides details of current and possible future threats. Developments in the immediate vicinity of the population or within the defined critical habitat of *Epiblema grandiflorum* var. *cyaneum* ms require assessment. No developments should be approved unless the proponents can demonstrate that they will have no significant impact on the taxon, its habitat or potential habitat, or the local surface or ground water hydrology.

Development proposals that are likely to impact on nearby wetlands that contain similar habitat also require survey and assessment as they may contain this taxon, or habitat suitable for translocation.

## 2. RECOVERY OBJECTIVE AND CRITERIA

### Objectives

The objective of this Interim Recovery Plan is to abate identified threats and maintain or enhance *in situ* populations to ensure the long-term preservation of the taxon in the wild.

### Criteria for success:

- Confirmation that plants of *Epiblema grandiflorum* var. *cyaneum* ms continue to occur in Population 1, or there is an increase in the number of plants recorded during the period of this plan.

- New population/s of this taxon are discovered and protected.
- There is successful development of methods of *ex situ* germplasm collection and propagation (including a 'living collection' of this taxon).

**Criteria for failure:**

- No plants of *Epiblema grandiflorum* var. *cyaneum* ms are recorded in Population 1 during the period of this plan.
- Development of methods of *ex situ* germplasm collection and propagation is unsuccessful.

### 3. RECOVERY ACTIONS

#### Existing recovery actions

The location and threatened status of the taxon are known to relevant CALM staff and this information is provided to other decision making authorities to ensure that the presence of the DRF is taken into account in management of the reserve and in planning decisions in lands surrounding the reserve.

Alterations to the surrounding hydrological pattern have occurred due to development of the surrounding habitat for housing. A drainage system with a gate has been installed to regulate the flow of water into and out of the swamp where this taxon occurs.

The groundwater level near the wetland in which Population 1 occurs is monitored regularly by the Water and Rivers Commission.

A cyclone fence was installed around the swamp habitat of this taxon in late 1996 to maintain the security of the population and prevent accidental damage. A pine bollard fence was erected at the same time around the perimeter of the public open space that surrounds the orchid habitat on three sides. This fence is expected to prevent vehicles entering the area. The condition of these barriers is monitored regularly and maintained as necessary by staff of CALM's Swan Coastal District.

The area in which the orchid occurs was declared a Nature Reserve in 1998.

Trees have been planted on the northern, western and southern side of the orchid habitat. It was anticipated that clearing for a recent housing development would result in a rise in the water table and trees were planted in 1996 to help mitigate this potential problem.

A fire management strategy has been developed by CALM's Swan Coastal District in consultation with relevant authorities as part of Draft Interim Management Guidelines developed for the Nature Reserve in which the orchid occurs (Department of Conservation and Land Management 2000a).

An article promoting public awareness of the *Epiblema grandiflorum* var. *cyaneum* ms appeared in the West Australian newspaper on 5 January 2001.

The Bennet Brook Catchment Group was successful in gaining Threatened Species Network funds through World Wide Fund for Nature (WWF) in 2002 to undertake habitat restoration including exotic tree removal and noxious weeds (veldt and African lovegrass) removal in the vegetation adjacent to *Epiblema grandiflorum* var. *cyaneum* ms habitat.

Staff of BGPA and UWA are currently researching the taxons' biology and ecology, including germination and propagation methods.

Two capsules of seed were collected from a single plant that flowered in 1999. This is in cryostorage at the BGPA.

The Swan Region Threatened Flora and Communities Recovery Team (SRFCRT) is overseeing the implementation of this IRP and will include information on progress in their annual report to CALM's Corporate Executive and funding bodies.

Staff from CALM's Swan Coastal District regularly monitor the population of this taxon.

### **Future recovery actions**

This taxon is currently only known from a Nature Reserve. Where any future populations are found to occur on lands other than those managed by CALM, permission will be sought from appropriate land managers prior to recovery actions being undertaken. The following recovery actions are roughly in order of descending priority; however this should not constrain addressing any of the priorities if funding is available for 'lower' priorities and other opportunities arise.

A Wetland Management Strategy (Bowman, Bishaw, Gorham 1995) and draft Interim Management Guidelines prepared by CALM staff (Department of Conservation and Land Management 2000a) are in place to help protect the orchid's habitat from impacts of adjacent development. This IRP will be implemented in conjunction with these documents.

#### **1. Coordinate recovery actions**

The SRFCRT will continue to coordinate recovery actions for *Epiblema grandiflorum* var. *cyaneum* ms and other Declared Rare Flora in their region. They will include information on progress in their annual report to CALM's Corporate Executive and funding bodies. Input and involvement will also be sought from any indigenous groups that have an active interest in areas that are habitat for the taxon.

**Action:** Coordinate recovery actions  
**Responsibility:** CALM (Swan Coastal District) through the SRFCRT  
**Cost:** \$1,600 per year

#### **2. Map critical habitat**

It is a requirement of the EPBC Act that spatial data relating to critical habitat be determined. Although critical habitat is described in Section 1, the areas as described have not yet been mapped and that will be done under this action. If any additional populations are located, then critical habitat will also be determined and mapped for these locations.

**Action:** Map critical habitat  
**Responsibility:** CALM (Swan Coastal District, WATSCU) through the SRFCRT  
**Cost:** \$2,000 in the first year

#### **3. Monitor water levels and quality**

The Department of Environment monitors the groundwater levels in a bore located close to the reserve in which Population 1 occurs. Data indicate that water levels have fluctuated seasonally from a minimum of around 28.6m AHD to a maximum of around 29.6m AHD. CALM has developed Draft Operational Guidelines for maintaining groundwater levels within this reserve (Department of Conservation and Land Management 2000b). These guidelines provide a basis for monitoring and artificially regulating wetland water levels to approximate the hydrological regime prior to the development of the surrounding land. The monitoring results will continue to be examined and the implications for management determined. Future

water quality monitoring will ideally include measurements of pesticides, and nutrient contamination in samples taken in spring.

**Action:** Monitor water levels and quality  
**Responsibility:** CALM (Swan Coastal District) through the SRTFCRT  
**Cost:** \$1,500 per year

#### 4. Evaluate taxonomy

The taxon is one of two varieties of the species *Epiblema grandiflorum*. The taxonomy will be evaluated if sufficient material is available.

**Action:** Evaluate taxonomy  
**Responsibility:** CALM (Science Division), BGPA through the SRTFCRT  
**Cost:** \$10,000 in first year

#### 5. Implement fire management strategy

Little is known about the effects of fire on this taxon, however, numbers of flowering specimens appears to increase following fire. It is likely that the taxon requires occasional fire for recruitment from soil stored seed, but fires during the vegetative and flowering phase from June to December may be detrimental to the long-term survival of the taxon. Fire also promotes the introduction of weed species.

A fire management strategy has been developed by CALM's Swan Coastal District in consultation with relevant authorities as part of Draft Interim Management Guidelines developed for the Nature Reserve in which the orchid occurs. If possible, management will include a mosaic of small recovery burns in April, or the first week of May at the latest, on a 10-15 year rotation within the reserve, to stimulate flowering.

**Action:** Implement fire management strategy  
**Responsibility:** CALM (Swan Coastal District), through the SRTFCRT  
**Cost:** \$1,000 per year

#### 6. Maintain access restrictions

Access to the area by foot is restricted. A complete ban on vehicular access at any time has been imposed. For this ban to be effective the gate will be locked at all times and the keys provided only to authorised personnel. In addition the fence condition will be monitored on a regular basis, and maintained.

**Action:** Maintain access restrictions  
**Responsibility:** CALM (Swan Coastal District) through the SRTFCRT  
**Cost:** \$500 per year

#### 7. Collect seed and fungi

Germplasm collections are essential due to the low number of plants and the possibility of damage or destruction of the habitat. Some seed of *Epiblema grandiflorum* var. *cyaneum* ms has now been collected but endophytic material isolated to date has failed to germinate seed. Further research is required to determine why no germination has occurred. Hand pollination is also required to promote a higher seed set. If it is not possible to collect adequate quantities of viable seed, other more costly methods of germplasm storage may need to be investigated. As it may be difficult to maintain the taxon as a living collection due to the specific

habitat requirements, research into overcoming seed dormancy issues should continue using seed collected from the common variety. These may involve living collections or storage of tissue culture material.

**Action:** Collect seed and fungi  
**Responsibility:** CALM (Swan Coastal District), BGPA through the SRTFCRT  
**Cost:** \$3,200 per year

## 8. Undertake weed control

The population is not weed infested at present. However, weed control in the buffer area near the cyclone fence is required, as it is possible that weeds may invade into the orchid habitat from that area. Weed monitoring will include regular searching for typha (*Typha orientalis*) invading the wetland area, as this probably represents the greatest weed threat to the orchid. Appropriate methods of weed control are found in Brown and Brooks (2002) and may include wick application of herbicides and hand slashing and pulling. All applications of weed control will be followed by a report on the method, timing and success of the treatment, and the effect on *Epiblema grandiflorum* var. *cyaneum* ms and associated native plant species. It is anticipated that native species in the habitat will regenerate after weed competition is removed.

**Action:** Undertake weed control  
**Responsibility:** CALM (Swan Coastal District) through the SRTFCRT  
**Cost:** \$500 per year

## 9. Monitor population

Annual monitoring of factors such as habitat degradation (including weed invasion and plant diseases), population stability (expansion or decline), pollination activity, seed production, recruitment, longevity and predation is essential. Insect predation of capsules will also be monitored. Hand pollination and enclosing flowers in hessian bags prior to capsule formation may be necessary if insects are impacting on reproductive potential. The population will be inspected annually with special attention given to any impacts from salinity. If salinity appears to be a threat, soil salinity and pH readings will be taken annually during winter and summer.

**Action:** Monitor population  
**Responsibility:** CALM (Swan Coastal District) through the SRTFCRT  
**Cost:** \$800 per year

## 10. Implement dieback hygiene

Dieback hygiene (outlined in Department of Conservation and Land Management 2003) will be implemented to prevent the introduction of dieback disease or amplification of the impact of the disease. The locked gate will continue to prevent public vehicular and foot access. People entering the reserve for management purposes will need to ensure any machinery used and footwear is clean. Purpose built signs advising of the dieback risk and high conservation values of the sites will be installed as required.

**Action:** Implement dieback hygiene  
**Responsibility:** CALM (Swan Coastal District) through the SRTFCRT  
**Cost:** \$800 per year

## 11. Conduct further surveys

Further surveys will be conducted for this taxon in appropriate habitat, and on private lands wherever possible, during the flowering period (late November to January). Volunteers from the local community, Wildflower Societies and Naturalist Clubs will be encouraged to be involved in surveys supervised by CALM staff. Areas considered suitable for translocation will also be noted. Priority for surveys will be as follows: similar wetlands that occur near Population 1; habitat of nearby populations of *Epiblema grandiflorum* var. *grandiflorum*; habitat of distant populations of *Epiblema grandiflorum* var. *grandiflorum* (including Walpole).

**Action:** Conduct further surveys  
**Responsibility:** CALM (Swan Coastal District) through the SRTFCRT  
**Cost:** \$1,300 per year

## 12. Obtain biological and ecological information

Increased knowledge of the biology and ecology of the species will provide a scientific basis for management of *Epiblema grandiflorum* var. *cyaneum* ms in the wild. Investigations will include:

1. Study of the role of various factors including disturbance, competition, rainfall and grazing in recruitment and seedling survival.
2. Determination of reproductive strategies, phenology and seasonal growth.
3. Investigation of the mating system and pollination biology (including investigation of the mixed population of *Epiblema grandiflorum* var. *cyaneum* ms and *Epiblema grandiflorum* var. *grandiflorum* to determine if the whole population that contains both varieties should be managed as one unit).
4. Investigation of population genetic structure, levels of genetic diversity and minimum viable population size (including genetic variation within the known population, within the mixed population of *Epiblema grandiflorum* var. *cyaneum* ms and *Epiblema grandiflorum* var. *grandiflorum*, and between Population 1 and the colour variant of *Epiblema grandiflorum* that occurs at Walpole).
5. Investigation of distribution of fungi associated with *Epiblema grandiflorum* var. *cyaneum* ms.

**Action:** Obtain biological and ecological information  
**Responsibility:** CALM (Science Division, Swan Coastal District), BGPA, through the SRTFCRT  
**Cost:** \$17,800 per year for the first three years

## 13. Promote awareness

The importance of biodiversity conservation and the protection of the Critically Endangered *Epiblema grandiflorum* var. *cyaneum* ms will be promoted to the public. An information sheet that includes a description of the plant, its habitat type, threats and management actions, and photos will be produced. Formal links with local groups and interested individuals will continue to be encouraged, as the WA Native Orchid Society and Study Group are currently involved in management of this orchid.

**Action:** Promote awareness  
**Responsibility:** CALM (Swan Coastal District) through the SRTFCRT  
**Cost:** \$1,300 in first year; \$600 per year thereafter

**14. Develop a translocation proposal**

Although translocations are generally undertaken under full Recovery Plans, it is possible to develop a translocation proposal and start propagating plants within the time frame of an Interim Recovery Plan. Initial steps required that will allow future translocations that can be undertaken as part of this IRP include developing effective methods of germplasm collection, storage and propagation (see future recovery action 7 above), clarification of critical habitat (see future recovery action 2 above), and surveys for suitable areas of similar, protected habitat (see future recovery action 11 above). Any future translocation proposal prepared by CALM and BGPA will be coordinated by the Swan Region Threatened Flora and Communities Recovery Team. Information on the translocation of threatened animals and plants in the wild is provided in CALM's Policy Statement No. 29 *Translocation of Threatened Flora and Fauna*.

**Action:** Develop a translocation proposal  
**Responsibility:** CALM (Science Division, Swan Coastal District), BGPA through the SRTFCRT  
**Cost:** \$6,200 in third and fourth years; \$13,300 in the fifth year

**15. Review the need for a full Recovery Plan**

At the end of the fourth year of the five-year term of this Interim Recovery Plan, the need for further recovery will be assessed. If the taxon is still ranked Critically Endangered at that time the need for further recovery actions, a full Recovery Plan, or to update this IRP will be assessed.

**Action:** Review the need for a full Recovery Plan  
**Responsibility:** CALM (WATSCU, Swan Coastal District) through the SRTFCRT  
**Cost:** \$22,700 in the fifth year (if required)

#### 4. TERM OF PLAN

This Interim Recovery Plan will operate from July 2004 to June 2009 but will remain in force until withdrawn or replaced. If the taxon is still ranked Critically Endangered after five years, the need to review this IRP or to replace it with a full Recovery Plan will be determined.

#### 5. REFERENCES

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- Erickson, R. (1978) *Orchids of the West, third edition*. University of Western Australia Press, Nedlands.
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- IUCN (2000) *IUCN red list categories prepared by the IUCN Species Survival Commission, as approved by the 51st meeting of the IUCN Council*. Gland, Switzerland.
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## 6. TAXONOMIC DESCRIPTION

### Hoffman and Brown (1998)

*Epiblema* - Babe in the Cradle

This genus consists of a single species with two varieties, both of which are endemic to the lower south-west of Western Australia.

In general appearance *Epiblema* flowers resemble those of the Sun Orchids, *Thelymitra*, as the labellum has a similar shape to the petal and sepals. The column shape however, is quite different. The labellum has a distinctive cluster of ribbon-like appendages and its flowers show no reaction to increases in temperature.

*Epiblema grandiflorum* var. *grandiflorum* is recognised by its long, narrowly rounded leaf and attractive purple flowers, each of which has a distinctive cluster of ribbon-like appendages near the base of its petal-like labellum. Other prominent features include its broadly-winged column and its late flowering period which starts near the end of November and continues well into January.

The obvious feature which distinguishes *Epiblema grandiflorum* var. *cyaneum* from the Babe in the Cradle, *Epiblema grandiflorum* var. *grandiflorum*, is its delicate pale blue colour. Otherwise both orchids are similar in shape and share the same habitat requirements.

### Adapted from the description for *Epiblema grandiflorum* var. *grandiflorum* in Jones (1988).

Leaf to 18 cm x 10 mm, linear, terete, dark green, very stiff, held erect. Flower stem to 60 cm tall, stiff and wiry, with two closely sheathing bracts, bearing two to eight blue dark spotted flowers to 35 mm across. Perianth segments to 20 mm x 12 mm, widely spreading, overlapping at the base, firm textured with darker veins and blotches. Dorsal sepal erect or recurved. Lateral sepals obliquely deflexed, divergent. Petals spreading or recurved. Labellum to 20 mm x 12 mm, ovate, flat or concave, petal-like, shortly stalked at the base. Lamina glands absent but there are two (separate or fused into one) rounded appendages at the base, together with a tuft of ribbon-like appendages which have white, clubbed tips. The column is broadly winged from near the base, the wings extending above the anther.

## SUMMARY OF RECOVERY ACTIONS AND COSTS

Recovery Action	Year 1			Year 2			Year 3			Year 4			Year 5		
	CALM	Other	Ext.	CALM	Other	Ext.	CALM	Other	Ext.	CALM	Other	Ext.	CALM	Other	Ext.
Coordinate recovery actions	1200	300	100	1200	300	100	1200	300	100	1200	300	100	1200	300	100
Map critical habitat	500		1500												
Monitor water levels and quality	500	500	500	500	500	500	500	500	500	500	500	500	500	500	500
Evaluate taxonomy	4000	2000	4000												
Implement fire management strategy	200		800	200		800	200		800	200		800	200		800
Maintain access restrictions	300		200	300		200	300		200	300		200	300		200
Collect seed and fungi		2000	1200		2000	1200		2000	1200		2000	1200		2000	1200
Undertake weed control	300		200	300		200	300		200	300		200	300		200
Monitor population	600		200	600		200	600		200	600		200	600		200
Implement dieback hygiene	200		600	200		600	200		600	200		600	200		600
Conduct further surveys	500	500	300	500	500	300	500	500	300	500	500	300	500	500	300
Obtain biological and ecological information	5800	5000	7000	5800	5000	7000	5800	5000	7000						
Promote awareness	600		700	600			600			600			600		
Develop a translocation proposal							400	600	5200	400	600	5200	1000	2000	10300
Review the need for a full Recovery Plan													15300		7400
Total	14700	10300	17300	10200	8300	11100	10600	8900	16300	4800	3900	9300	20700	5300	21800
Yearly Total		<b>42,300</b>			<b>29,600</b>			<b>35,800</b>			<b>18,000</b>			<b>47,800</b>	

NHT = External funding (funding to be sought), Other = funds contributed by NHT, in-kind contribution and BGPA.

Total CALM: \$61,000  
 Total Other: \$36,700  
 Total External Funding: \$75,800  
**TOTAL COSTS: \$173,500**

