

**Advice to the Minister for the Environment, Heritage and the Arts
from the Threatened Species Scientific Committee (the Committee)
on Amendments to the list of Threatened Species
under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act)**

1. Scientific name (common name)

Caladenia procera (Carbunup King Spider Orchid)

2. Reason for Conservation Assessment by the Committee

This advice follows assessment of information gathered through the Commonwealth's Species Information Partnership with Western Australia, which is aimed at systematically reviewing species that are inconsistently listed under the EPBC Act and relevant state legislation/lists.

This is the Committee's first assessment of the species under the EPBC Act.

3. Summary of Conclusion

The Committee judges that the species has been demonstrated to have met sufficient elements of Criterion 1 to make it **eligible** for listing as **endangered**.

The Committee judges that the species has been demonstrated to have met sufficient elements of Criterion 2 to make it **eligible** for listing as **critically endangered**.

The Committee judges that the species has been demonstrated to have met sufficient elements of Criterion 3 to make it **eligible** for listing as **critically endangered**.

The Committee judges that the species has been demonstrated to have met sufficient elements of Criterion 4 to make it **eligible** for listing as **vulnerable**.

The highest category for which the species is eligible to be listed is **critically endangered**.

4. Taxonomy

The species is conventionally accepted as *Caladenia procera* (Carbunup King Spider Orchid). It was previously considered to be a subspecies of *Caladenia pectinata* but is now formally described as a separate species (Hopper & Brown 2001; Stack & English 2004).

5. Description

The Carbunup King Spider Orchid is a herb that dies back to a dormant tuber during the summer months. It grows to 70 cm tall, and has a single, pale green leaf that is 10–30 cm long and 6–10 mm wide. Each plant has 1–3 spider-like flowers. The stiffly-held petals and sepals are greenish lemon yellow with lines and spots of dark maroon to pink (Hoffman & Brown, 1998; Stack & English, 2004).

6. National Context

The Carbunup King Spider Orchid is currently listed in Western Australia under the *Wildlife Conservation Act 1950* as Declared Rare Flora (Gazetted in April 2002) and ranked Critically Endangered under the IUCN Red List.

This species is endemic to a small area (extent of occurrence of approximately 100 km²) south-west of Busselton in south-western WA (Hopper & Brown, 2001; Stack & English, 2004). All subpopulations occur within the South West NRM region (CALM, 2006). The area of occupancy is unknown but would be much smaller than the extent of occurrence. It is most likely that the area of occupancy is significantly less than 15 km², which is the extent of occurrence of subpopulations 1 to 4 (not including subpopulation 5 which contains only one plant).

Although it is locally common the Caribunup King Spider Orchid is a highly restricted species (Hopper & Brown, 2001). The most recent survey indicated a total population size of approximately 92 mature individuals (CALM, 2006). However, as not all subpopulations were surveyed during the species' flowering period, the Committee has estimated a total population size of 276. This population estimate is based on data derived from the most recent surveys carried out during the flowering period.

7. Relevant Biology/Ecology

The Caribunup King Spider Orchid grows in Jarrah (*Eucalyptus marginata*), Marri (*Corymbia calophylla*) and Peppermint (*Agonis flexuosa*) woodland on alluvial sandy-clay loam flats, with Mangles Kangaroo Paw (*Anigozanthos manglesii*) amongst dense heath and sedges or low dense shrubs (Hopper & Brown, 2001; Stack & English, 2004). Other associated species include *Acacia stenoptera* and *Pimelea sylvestris* (WA Herbarium, 2006).

The above ground growing phase of the Caribunup King Spider Orchid extends typically from March to late November with flowering between September and October (Stack & English, 2004; Hoffman & Brown, 1998). During the dry summer period plants survive as dormant underground tubers. Following the break of the season a single leaf emerges above ground and mycorrhizal (soil-inhabiting fungi, symbiotic) associations become active. As *Caladenia* species have no roots, the infection point for mycorrhizal associations is in the collar (immediately above the tuber). During winter the replacement tuber, which is essential for survival during the following year, is initiated and continues to develop until late in the growing season. Not all plants in a population will produce flowers in any one year. Generally, for every plant in flower, a number of immature vegetative plants will be present. The proportion of flowering to non-flowering individuals is influenced by environmental conditions including the presence or absence of summer fire and the amount of rainfall received during winter and spring (A. Brown, pers. comm.; Stack & English, 2004).

Flowering individuals will produce a bud early in the growing season that continues to develop until flowering. Plants flower for approximately two weeks or until pollination (by Thynnid wasps), after which flowers collapse and, if pollination was successful, a seed capsule develops. The capsule swells as the seeds mature, taking from six to eight weeks to develop depending on climatic conditions. If temperatures are higher than average seeds may mature faster. Prior to seeds being released the capsule turns yellow and then brown. Small slits develop in the capsule from which the seed is dispersed by the wind (A. Brown, pers. comm.; Stack & English, 2004).

Seeds will remain dormant in the soil over summer until the break of the season in the following year. Once wet, the seeds imbibe water and the seed coat splits. At this point infection by a suitable fungus is required for germination to occur. A protocorm will then form and, if conditions are right, develop into a small seedling by forming a dropper tuber and leaf. Not all germinants will mature, as those that fail to produce a tuber will not survive the dry summer conditions. If no fungus is present, seeds remain dormant with those that are not predated quickly losing their viability (Batty *et al.*, 2000).

Orchid seedlings are very small for the first growing season and are difficult to locate. Leaves are typically less than 20 mm long and only a few millimetres wide. Typically, it appears that leaf and tuber size increase over the next four to five years until adult plants capable of flowering are

present. However, under ideal conditions plants can sometimes flower within two years of germination (A. Brown, pers. comm.; Stack & English, 2004). It is thought that *Caladenia procera* takes between two and six years (A. Brown, pers. comm.; Stack & English, 2004) to reach sexual maturity, therefore generation length will be greater than two to six years. Data on the closely related *Caladenia huegelii* indicates plants up to 19 years old.

8. Description of Threats

The Carburnup King Spider Orchid is currently managed as critically endangered in Western Australia due to its limited distribution, limited number of plants, the threat of continued decline in the number of plants, and the extent and quality of habitat. The main threats to this species are clearing for development and grazing, there is also the potential for road and firebreak maintenance, weed invasion, inappropriate fire regimes and recreational impacts to become a threat (Stack & English, 2004).

Land clearing is currently a threat to subpopulations 2 and 4 where residential development is planned and subpopulation 5 where gas pipeline construction will have an impact. Inappropriate fire regimes may affect the viability of populations. Fires that occur when the orchid has above ground growth can prevent seed set and possibly kill the tuber before it builds up the sufficient starch reserves. Dormancy periods may be ‘artificially’ lengthened by the heat produced by fire (Stack & English, 2004). Subpopulation 1a was burnt during 2003.

Terrestrial orchids also require the presence of suitable soil fungi to maintain growth and development of plants and also for recruitment to occur. The seeds will not germinate under natural conditions in the absence of suitable fungi (Stack & English, 2004).

This species relies on specific pollinator species for seed set. Fragmentation of populations may therefore result in loss of pollinators (Stack & English, 2004).

Drought conditions may also cause plant death or result in fewer flowering individuals (A. Brown, pers. comm.; CALM, 2006).

Caladenia procera is known to hybridize with *Caladenia attingens* (Hopper & Brown, 2001) potentially reducing genetic diversity within the species.

9. Public Consultation

The information used for this assessment was made available for public exhibition and comment. The Committee has had regard to all public comment that was relevant to the survival of the species.

10. How judged by the Committee in relation to the criteria of the EPBC Act and Regulations

The Committee judges that the species is **eligible** for listing as **critically endangered** under the EPBC Act. The assessment against the criteria is as follows:

Criterion 1: It has undergone, is suspected to have undergone or is likely to undergo in the immediate future a very severe, severe or substantial reduction in numbers

There is little repeat survey data to show a decline in extent of occurrence in the past, although it is likely that clearing may have reduced its habitat before its discovery. The development of this species' habitat for residential subdivisions is likely to further reduce the extent of occurrence in the immediate future (CALM, 2006).

There is some decline in area of occupancy due to clearing and inappropriate fire regimes. Subpopulations are severely fragmented due to clearing for agriculture and residential development. A portion of the remaining habitat (at subpopulations 2 and 4) is now subject to development for residential and associated purposes (Stack & English, 2004). As land clearing and development continues to threaten subpopulations it is likely that it will continue to reduce the area of occupancy in the immediate future (CALM, 2006).

The current population size is reported to be approximately 92 mature individuals. However, recent surveys undertaken were not during the flowering period therefore the number of plants could not be recorded accurately (CALM, 2006). As surveying of many orchid species relies on the presence of flowering plants, survey dates are important. It should also be noted that not all plants flower each year. Therefore, survey results are likely to be a conservative estimate of population numbers. If population numbers from previous years that were recorded during the flowering period are included, it is likely that the population size is closer to 276.

The survey data suggests that subpopulations are stable. However, the current threats associated with residential development in and adjacent to some subpopulations (2 and 4) indicate that there is likely to be subpopulation decline in the immediate future (CALM, 2006).

Subpopulations 2 and 4 are the largest of the five known populations of Caribunup King Spider Orchid. Development at subpopulation 4 is underway with a permit to translocate 32 plants into a proposed conservation area within the site. It is unlikely that all translocated plants will survive in the medium term (Australian Network for Plant Conservation Translocation Working Group 2004). However, presuming a 100% translocation success rate, the development is likely to nonetheless result in the loss of the remaining 75 plants. It is possible that some of the 75 remaining plants will also occur within the conservation area however relevant information is not available to the Committee.

Development is also proposed for subpopulation 2 which threatens the existence of up to 79 mature individuals. While it is noted that negotiations are currently underway regarding the conservation of a portion of the subpopulation, agreement has yet to be reached with the developer (Stack & English 2004). Consequently, in assessing the status of the species against criteria the Committee concludes that the entire subpopulation of 79 mature individuals is currently under threat of extinction.

As a result of these two development proposals, the Committee concludes that there is likely to be a total reduction of 154 individuals or 56% of the total population in the coming decade. This is considered to be a severe reduction.

The Committee considers that the species is likely to undergo a severe reduction in numbers. Therefore, the species has been demonstrated to have met the relevant elements of Criterion 1 to make it **eligible** for listing as **endangered**.

Criterion 2: Its geographic distribution is precarious for the survival of the species and is very restricted, restricted or limited

Although the species is locally relatively common, the Carburnup King Spider Orchid is a highly restricted species (Hopper & Brown, 2001). The extent of occurrence of this species is approximately 100 km² and the area of occupancy is likely to be significantly less than 15 km². There is little repeat survey data to show a decline in extent of occurrence in the past, although it is likely that clearing reduced available habitat before its discovery. The threat of development at a number of the sites and further fragmentation of remaining habitat makes the distribution of the species precarious.

There is some decline in area of occupancy due to clearing and inappropriate fire and as land clearing and development continues to threaten subpopulations it is likely to continue to reduce the area of occupancy in the immediate future (CALM, 2006).

Subpopulations are severely fragmented due to clearing for agriculture and residential development. The distribution of the Carburnup King Spider Orchid is reliant on the presence of germinating and pollinating agents. The fragmentation of habitat will impact particularly on the pollination of the species as the Thynnid wasps that pollinate the plants rely on intact habitat to utilise other plant species for food (A. Brown, pers. comm.).

The Committee considers that the species has a very restricted geographic distribution and that proposed development and further fragmentation indicate the survival of the species is precarious. Therefore, the species has been demonstrated to have met the relevant elements of Criterion 2 to make it **eligible** for listing as **critically endangered**.

Criterion 3: The estimated total number of mature individuals is limited to a particular degree; and either

(a) evidence suggests that the number will continue to decline at a particular rate; or

(b) the number is likely to continue to decline and its geographic distribution is precarious for its survival.

Survey data suggests that the total population of the Carburnup King Spider Orchid is approximately 276 mature individuals and therefore the population is low. The identification of the presence of an orchid species at a site relies on flowering plants and not all plants produce flowers each year. The number of flowering plants at a site can also fluctuate. Fluctuations can be caused by seasonal conditions including the presence or absence of summer fire and the amount of rainfall received during winter and spring (A. Brown, pers. comm.; Stack & English, 2004).

If proposed development continues and subpopulations such as subpopulation 2 are cleared for residential development, the decline in population numbers will be very high. The loss of subpopulation 2 alone would result in an almost 30% reduction in the total population size. If subpopulation 4 is also impacted, even if 32 individual plants are successfully translocated under permit, it could also result in close to a 30% reduction in population size. The possibility of both subpopulations being significantly effected by development, causing further fragmentation and decline in habitat quality and also influencing pollinator populations, indicates that the distribution of the species is precarious.

The Committee considers that the estimated total number of mature individuals of the species is low; that evidence suggests that the number will continue to decline at a very high rate; and the species' geographic distribution is precarious for the survival of the species. Therefore, the species has been demonstrated to have met the relevant elements of Criterion 3 to make it **eligible** for listing as **critically endangered**.

Criterion 4: The estimated total number of mature individuals is extremely low, very low or low

Survey results indicate that the total population of the Caribunup King Spider Orchid approximately 276 mature individuals.

The Committee considers that the estimated total number of mature individuals of the species is low. Therefore, the species has been demonstrated to have met the relevant element of Criterion 4 to make it **eligible** for listing as **vulnerable**.

Criterion 5: Probability of extinction in the wild that is at least:

- (a) 50% in the immediate future; or**
- (b) 20% in the near future; or**
- (c) 10% in the medium-term future.**

There are no data available to estimate a probability of extinction of the species in the wild over a relevant timeframe. Therefore, as the species has not been demonstrated to have met the required elements of Criterion 5, it is not eligible for listing in any category under this criterion.

11. CONCLUSION

This advice follows assessment of information gathered through the Commonwealth's Species Information Partnership with Western Australia which is aimed at systematically reviewing species that are inconsistently listed under the EPBC Act and relevant state legislation.

Land clearing for development is the main threat to the species. The Committee considers that the species is likely to undergo a severe reduction in numbers. Therefore, the species has been demonstrated to have met the relevant elements of Criterion 1 to make it **eligible** for listing as **endangered**.

As well as the loss of some plants to clearing, the further fragmentation of extant populations threatens the species as pollination is reliant on wasp species that have specific habitat requirements. The germination and development of plants is also reliant on mycorrhizal fungi. The Committee considers that the species has a very restricted and precarious distribution. Therefore, the species has been demonstrated to have met the relevant elements of Criterion 2 to make it **eligible** for listing as **critically endangered**.

The Committee considers that the estimated total number of mature individuals of the species is low; that evidence suggests that the number will continue to decline at a very high rate; and the species' geographic distribution is precarious for the survival of the species. Therefore, the species has been demonstrated to have met the relevant elements of Criterion 3 to make it **eligible** for listing as **critically endangered**.

The total population size of the Caribunup King Spider Orchid fluctuates with climatic conditions but the Committee considers the estimated number of mature individuals of the species is low. Therefore, the species has been demonstrated to have met the relevant elements of Criterion 4 to make it **eligible** for listing as **vulnerable**.

The highest category for which the species is eligible to be listed is **critically endangered**.

Recovery Plan

The Committee considers that there should be a recovery plan for this species. Most populations of the Caribunup King Spider Orchid occur on local road reserves and private property and are subject to a number of land use threats. These can be better managed with a recovery plan in place.

12. Recommendation

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

***Caladenia procera* (Carbunup King Spider Orchid)**

- (ii) The Committee recommends that there be a recovery plan for this species

Associate Professor Robert J.S. Beeton

Chair

Threatened Species Scientific Committee

13. References cited in the advice

- Australian Network for Plant Conservation Translocation Working Group (2004). *Guidelines for the Translocation of Threatened Plants in Australia*. Australian Network for Plant Conservation, Canberra, ACT, Australia.
- Batty, A.L., Dixon, K.W. & Sivasithamparam, K. (2000). Soil seed-bank dynamics of terrestrial orchids. *Lindleyana* 15: 227–236.
- CALM (2006). Records held in CALM's Declared Flora Database and Rare Flora Files. WA Department of Conservation and Land Management.
- Hoffman, N. & Brown, A. (1998). *Orchids of South-West Australia*, University of Western Australia Press, Nedlands.
- Hopper, S. & Brown, A. (2001). Contributions to Western Australian Orchidology 2. New Taxa and Circumscriptions in *Caladenia* (spider, fairy and dragon orchids of Western Australia). *Nuytsia* 14: 141–143.
- Stack, G. & English, V. (2004). *Carbunup King Spider Orchid (Caladenia procera) Interim Recovery Plan 2004–2009*, Department of Conservation and Land Management, Wanneroo.
- Western Australian Herbarium (2006). Florabase — The Western Australian Flora. Department of Conservation and Land Management. <http://florabase.calm.gov.au/>