The Minister's delegate approved this Conservation Advice on 16/12/2016.

Conservation Advice

Caladenia orientalis

eastern spider-orchid

Conservation Status

Caladenia orientalis (eastern spider-orchid) is listed as Endangered under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth) (EPBC Act) effective from the 16 July 2000. The species was eligible for listing under the EPBC Act as on 16 July 2000 it was listed as Endangered under Schedule 1 of the preceding Act, the *Endangered Species Protection Act 1992* (Cwlth).

Species can also be listed as threatened under state and territory legislation. For information on the listing status of this species under relevant state or territory legislation, see http://www.environment.gov.au/cgi-bin/sprat/public/sprat.pl

The main factors that are the cause of the species being eligible for listing in the Endangered category are its small population size, limited distribution and continuing decline due to threats from habitat loss and degradation, weed invasion and grazing.

Description

The eastern spider-orchid (Orchidaceae) is an herbaceous perennial geophyte which is 20 cm high, with a single leaf 15 cm long and one to two flowers. It is a deciduous orchid that dies back annually to a small, spherical, underground tuber. The single leaf is green, long and narrow (Backhouse & Jeanes 1995). The erect hairy flower stem grows to 20 cm tall and has one or two large creamy white to pale yellow flowers to 80 mm across (Duncan et al., 2010). The sepals and petals are up to 10 cm long and slender with long tips covered with dark red-brown glands (Duncan et al., 2010). The central petal (labellum) is triangular with a rolled tip. The expanded part of the labellum has four rows of short red glands and the sides are fringed with moderately long thickened teeth decreasing in size and extending almost to the labellum tip (Duncan et al., 2010).

Distribution

The eastern spider-orchid is endemic to Victoria. As at 2006, this species may have occurred on the Freycinet Peninsula in Tasmania (Bishop 2006), however these records were not confirmed.

In 2010, the historical distribution of the eastern spider-orchid included coastal habitats from the eastern shore of Port Phillip Bay to Yarram in South Gippsland (Duncan et al., 2010). This species was extinct on the Mornington Peninsula, Yarram-Hedley region and the Latrobe Valley (Duncan et al., 2010). In 2010, the eastern spider-orchid was distributed between Port Campbell and Yarram, with six populations containing an estimated 350 individuals known within this range (Duncan et al., 2010).

Relevant Biology/Ecology

The eastern spider-orchid is found in coastal heathland and heath-woodland, generally on deep sands, in the South East Coastal Plain Interim Biogeographic Regionalisation for Australia Bioregion (Duncan et al., 2010). Individuals may have periods of many years between flowering events (Duncan et al., 2010). The species requires periodic fire to stimulate flowering and seed production (Duncan et al., 2012). Long-term results from demographic monitoring suggests that this species is likely to require fire intervals of between five and fifteen years for survival (Duncan 2016).

The eastern spider-orchid is a winter active geophyte with emergence occurring in concert with cooler conditions and onset of winter rainfall. Flowering in the eastern spider-orchid occurs from September to November and is followed by summer dormancy (Backhouse & Jeanes 1995). This species is known to hybridise with *Caladenia tessellata* (thick-lip spider-orchid) to provide the very rare *Caladenia* x *variabilis* (Backhouse & Jeanes 1995). The pollinator of the orchid is unknown.

The following information applies to the general biology and ecology of spider-orchids.

Spider-orchids use either food deception or sexual deception for pollination (Jones 1988; Bishop 2006). The usual pollinators for spider-orchids are male wasps from the family Thynnidae. A scent that mimics female thynnid wasp pheromone is produced by the glandular tips of the sepals and acts as a sexual attractant for the pollinators (Backhouse & Jeanes 1995; Bishop 2006). Once the pollinator reaches the flower, it attempts to copulate with the labellum of the flower, mistaking it for the female wasp, and effects pollination (Todd 2000). The life cycle and ecological requirements of pollinators involved in sexual deception is generally unknown and represents a major risk in management the long-term reproductive capability of the orchid.

Spider orchids generally reproduce from seed (Backhouse & Jeanes 1995). Fruits of spider-orchids normally take five to eight weeks to reach maturity following pollination and each mature capsule may contain tens of thousands of microscopic seeds that are dispersed by the wind when the capsule dries out (Todd 2000). Most spider-orchids grow in a complex relationship with mycorrhizal fungi (Warcup 1981). The fungus assimilates some nutrients for the orchid, but the degree of nutritional dependence upon the fungus by spider-orchids is not clearly understood (Todd 2000). The long term persistence of a suitable mycorrhiza is however critical for growth and development of the orchid yet little is known of the ecological requirements for long-term maintenance of the mycorrhizal fungus in soil. Longevity of most spider-orchids is not known but there are examples of individuals of one species having survived for at least 17 years in the wild (Carr 1999).

Most terrestrial orchids have evolved under conditions of hot summer fires, generally when the plants have been dormant (Backhouse & Jeanes 1995). Some *Caladenia* species flower vigorously following hot summer fires (Backhouse & Jeanes 1995; Todd 2000). However, this may be as much the result of the removal of surrounding vegetation and reduced competition as any chemical effect of the fire (Backhouse & Jeanes 1995). The timing of fire for orchids is important, with the best time during late summer or early autumn, after seed dispersal but prior to new plant emergence. The variation in seasonal climatic conditions, most notably rainfall and temperature also influences flowering. Flowering is often aborted when periods of sustained hot, dry weather follow flower opening (Todd 2000).

Threats

The eastern spider-orchid is at risk from a combination of threats across its range. Risk posed by each of these threats may vary depending on geographical, environmental, biological and sociological factors.

Table 1 – Threats impacting the eastern spider-orchid in approximate order of severity of risk, based on available evidence.

Threat factor	Threat type and status	Evidence base
Habitat loss, disturbance and modification		
Land clearance for residential development	known current	In 2010, land clearance for residential development was a major threat to one population (Duncan et al., 2010).

Trampling	known current	In 2010, trampling including the accidental damage to individual plants and/or seedlings by recreational users was a known threat at two populations (Duncan et al., 2010).
Fire		
Timing and frequency	known current	*Caladenia orientalis* is a fire-stimulated species. Results of long-term demographic monitoring suggest a fire interval of between five and fifteen years is required to stimulate sufficient flowering and subsequent seed set for survival of populations. Population declines (that is, declines in rates of emergence) have been associated with both too infrequent and too frequent fires (Duncan et al., 2016).
Invasive species		
Weed invasion	known current	In 2010, weed invasion (predominantly large increases in the cover of tall shrubs) was a known threat at three sites. Weeds can directly out-compete the eastern spider-orchid for resources and change the vegetation type and structure of habitat. Weeds can also alter microhabitats, which can indirectly cause a negative impact on orchid species (Duncan et al., 2005). Problem species included coast tea-tree (*Leptospermum laevigatum*) and coast wattle acacia (*Acacia longifolia* subsp. *sophorae*) (Duncan et al., 2016).

Conservation Actions

Conservation and Management priorities

Habitat loss, disturbance and modification

- Ensure public and private land managers are aware of the presence and location of the eastern spider-orchid on their land and provide protection measures against known and potential threats to the species.
- Manage access to known locations of the eastern spider-orchid to prevent the accidental trampling of plants.

Fire

- Fires must be managed to ensure that prevailing fire regimes do not disrupt the life cycle of the eastern spider-orchid, that they support rather than degrade the habitat necessary to the eastern spider-orchid, that they do not promote invasion of exotic species, and that they do not increase impacts of grazing.
- Ensure that prescribed fires occur only within the habitat during the dormant phase of the eastern spider-orchid's life cycle (summer to mid autumn).
- Physical damage to the habitat and individuals of the eastern spider-orchid must be avoided during and after fire operations. Ensure retention of surface soil organic material and leaf litter on soil as it is important for many terrestrial orchids that rely on these materials for regeneration from seed.
- Fire management authorities and land management agencies should use suitable maps and install field markers to avoid damage to the eastern spider-orchid.

Invasive species

- Collaborate with public and private land managers to control and reduce the spread of invasive species. Supplement ecological burning with manual and chemical removal of tall shrubs (principally coast tea-tree and coast wattle) to reduce cover to benchmark levels.

Seed collection, propagation and other ex-situ recovery action

- Establish plants in cultivation in appropriate institutions such as the Royal Botanic Gardens Victoria.
- To manage the risk of losing genetic diversity, undertake appropriate seed and mycorrhizal fungi collection and storage in appropriate institutions, such as the Victorian Conservation Seedbank, Royal Botanic Gardens Victoria, and curate the collection to ensure viability of stored seed. Seeds from representative natural populations to be collected and stored.

Stakeholder engagement

- Identify partners including traditional owners, landholders, community-based organisations and conservation management organisations that may be associated with recovery of the eastern spider-orchid.
- Promote opportunities for partners to participate in recovery efforts for the eastern spider-orchid, as appropriate.

Survey and Monitoring priorities

- Undertake survey work, when plants are flowering from September to November, in suitable habitat and potential habitat to locate any additional occurrences including previously identified known populations to establish baselines where required to identify changes (if any) in population size, distribution, ecological requirements and relative impacts of threatening processes.
- Monitor the progress of recovery, including the effectiveness of management actions and the need to adapt them if necessary.
- Monitor the size, structure and reproductive status of populations of eastern spider-orchids at different stages in the fire cycle. Opportunities to monitor after planned and unplanned fires should be undertaken where they occur in order to improve understanding of the fire response of this species.
- Precise fire history records must be kept for the habitat and extant populations (confirmed and suspected) of the eastern spider-orchid.

Information and research priorities

- Investigate options for linking, enhancing or establishing additional populations.
- Investigate reproductive status, longevity, fecundity and recruitment levels for this species in order to form a view on the resilience of this species to known and potential threats and adjust conservation actions as required.
- Continue to undertake seed germination and/or vegetative propagation trials to determine the requirements for successful establishment, including disturbance and mycorrhizal fungi requirements.
- Improve understanding of the mechanisms of response to different fire regimes and identify appropriate fire regimes for conservation of this species by undertaking appropriately designed experiments in the field and/or laboratory.

- Where appropriate, use understanding and research on fire response among related (e.g. congeneric) or functionally similar species to develop fire management strategies for conservation.
- Identify optimal fire regimes for regeneration (vegetative regrowth and/or seed germination), and response to other prevailing fire regimes.
- Investigate environmentally sustainable methods of broad-scale control of encroachment of tall shrubs into heathland habitats of the eastern spider-orchid.
- Undertake research into pollinator activity and the ecological requirements to support pollinator communities of the orchid.

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