SURVEY GUIDELINES FOR AUSTRALIA'S THREATENED ORCHIDS

GUIDELINES FOR DETECTING ORCHIDS LISTED AS 'THREATENED' UNDER THE *ENVIRONMENT PROTECTION AND BIODIVERSITY CONSERVATION ACT* 1999

Authorship and acknowledgements

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GLOSSARY

Department: Australian Government agency responsible for the administration of the Commonwealth's *Environment Protection and Biodiversity Conservation Act 1999*.

EPBC Act: Environment Protection and Biodiversity Conservation Act 1999.

Epiphytic orchids: Orchids growing on other plants.

False negative observation: The failure to detect a target species when it is present.

False positive observation: The misidentification of a similar species as the target species during survey.

Lithophytic orchids: Orchids growing on rock outcrops, boulders, cliffs and escarpments.

Terrestrial orchids: Orchids growing in soil.

1. HOW TO USE THESE GUIDELINES

The purpose of this document is to provide guidelines for surveying Australia's threatened orchids listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). There are 228 orchids listed under the EPBC Act (as at 2013) which include terrestrial, epiphytic and lithophytic orchids. It is possible that additional species may be added to this list in the future, and if that happens, surveys for these species should consider these guidelines.

These guidelines are applicable to all those interested in surveying for orchid species, however, they are primarily aimed at proponents (those proposing to undertake development, activities or actions), consultants (those who conduct and/or report on threatened species in surveys and assessments) and decision makers (those who are responsible for assessing impacts on threatened orchid species). The information in these guidelines has been designed for those with sound understanding, experience and skills in conducting ecological surveys, in particular, surveys for orchids.

In view of the differences in the biology and ecology of terrestrial, epiphytic and lithophytic orchids, these three groups are considered separately in the survey methodology. It should be noted, however, that some orchid species can grow in multiple locations, for example, perched on both trees and rocks, or in soil in the ground and in the forks of trees.

These guidelines include a supporting table (Table 1) with information on each of the 228 orchids listed in the EPBC Act. It should be noted that very little is known about the habitat needs and ecology of some orchids, making it difficult to determine adequate levels of survey effort. In addition, species' habitat needs may vary across different regions. Local information should always be sought, and you should use your professional judgement, backed up by sound reasoning and scientific information.

The taxonomic names used in this document are in line with the most current version endorsed by the Council of Heads of Australasian Herbaria, however, it is acknowledged that orchid taxonomy is transitory. Australian orchids are likely to be subject to future taxonomic review, however, a review would not necessarily change the threat or listing status of the species under the EPBC Act. This can only change if the minister has approved a change consistent with the requirements of the Act. Current taxonomic listing status should be checked with the department and state/territory agencies as appropriate.

These survey guidelines are not mandatory. Proposals failing to meet these guidelines for reasons of efficiency, cost or validity will not necessarily default to a judgement that a significant impact is likely, especially where the proponent provides an evidence-based rationale for a different survey technique. Furthermore, alternative methods to a dedicated survey may also be appropriate. You should consider the proposal's impact in the context of the species' national, regional, district and site importance to establish the most effective survey approach. If you deviate from the survey effort or methods outlined in these guidelines, the Department of the Environment recommends that a scientifically valid justification that refers to scientific literature or expert testimony evidence be provided.

It is recommended that this document be read in conjunction with the Australian Government EPBC Act Policy Statement 1.1 Significant Impact Guidelines – Matters of National Environmental Significance. Note that executing a survey to the standard within these guidelines and identifying the presence of listed species does not in itself predict a 'significant impact'. The presence or absence of a listed species is one of many factors taken into account when deciding on the likelihood of a 'significant impact'. You should use the presence of a species as a consideration in establishing whether a 'significant impact' is likely or certain. As part of the assessment process, sufficient information is usually required to determine if a species' presence at a site constitutes a 'population' and/or 'important population' as defined in the *Significant Impact Guidelines 1.1* publication. Surveys conducted using these survey guidelines will not necessarily generate information on

whether the species' occurrence constitutes a 'population' or 'important population'. Should scientifically based information on these aspects be known, its inclusion in a referral can help inform the assessment process.

Information on species that occur at very low abundance or in very small populations, such as some orchids, may be important when considering the likelihood of a significant impact from the proposed actions. These survey guidelines do not establish or assess species' abundance, as determining abundance would require greater temporal and spatial survey effort than determination of presence/absence and different design within a given site. Before undertaking a survey you may wish to contact the department to discuss your project.

These survey guidelines were developed using the best available information at the time of writing. Consultation with orchid experts from tertiary institutions, state and territory departments and agencies, and orchid societies was undertaken to determine the most appropriate survey techniques and survey effort for the detection of nationally listed threatened orchids.

The Species Profiles and Threats Database (SPRAT) profiles for these orchid species provide further detailed information on the biological and ecological context for survey guidelines, 'significant impact' guidance and mitigation measures. SPRAT profiles can be accessed at the department's website: www.environment.gov.au/cgi-bin/sprat/public/sprat.pl State and territory government agencies also hold relevant information including habitat and species' distribution information. Further information on these orchids may also be found in various state conservation agency and state herbaria websites:

State	Relevant websites
Commonwealth	Species Profile and Threats Database Atlas of Living Australia Protected Matters Search Tool Australia's Virtual Herbarium (http://avh.ala.org.au/)
New South Wales	Office of Environment and Heritage (http://www.environment.nsw.gov.au/) Threatened species website (http://www.environment.nsw.gov.au/threatenedspecies/index.htm) Bionet (http://www.bionet.nsw.gov.au/) NSW Flora online (http://plantnet.rbgsyd.nsw.gov.au/)
Victoria	Department of Environment and Primary Industries (http://www.dse.vic.gov.au/) Threatened species website (http://www.dse.vic.gov.au/plants-and-animals/native-plants-and-animals/threatened-species-and-communities) Victorian Biodiversity Atlas (http://www.dse.vic.gov.au/plants-and-animals/native-plants-and-animals/victorian-biodiversity-atlas) National Herbarium of Victoria (http://www.rbg.vic.gov.au/science/information-and-resources/national-herbarium-of-victoria)
South Australia	Department of Environment, Water and Natural Resources (http://www.environment.sa.gov.au/Home) Threatened species

	(http://www.environment.sa.gov.au/Plants_Animals/Threatened_species_ecological_communities) State Herbarium (http://www.environment.sa.gov.au/Science/Science_research/State_Herbarium) Consensus of SA plants, algae and fungi, vertebrates (http://www.environment.sa.gov.au/Knowledge_Bank/Information_data/)
Western Australia	Department of Environment and Conservation (http://www.dec.wa.gov.au/) Threatened species (http://www.dec.wa.gov.au/management-and-protection/threatened-species.html) Western Australian Herbarium (http://www.dec.wa.gov.au/our-environment/science-and-research/wa-herbarium.html) FloraBase (http://florabase.dec.wa.gov.au/)
Northern Territory	Department of Land Resource Management (http://www.lrm.nt.gov.au/) State Herbarium (http://www.lrm.nt.gov.au/)
Queensland	Department of Environment and Heritage Protection (http://www.ehp.qld.gov.au/) Threatened species (http://www.ehp.qld.gov.au/wildlife/threatened-species/index.html) Queensland Herbarium (http://www.ehp.qld.gov.au/plants/herbarium/)
Australian Capital Territory	Department of Environment and Sustainable Development (http://www.environment.act.gov.au/) Threatened species (http://www.environment.act.gov.au/cpr/conservation_and_ecological_communities) Australian National Botanic Gardens (http://www.anbg.gov.au/gardens/plantinfo/index.html)
Tasmania	Department of Primary Industry, Parks, Water and Environment (http://www.dpiw.tas.gov.au/inter.nsf/Home/1?Open) Threatened Species Link (http://www.threatenedspecieslink.tas.gov.au/) Flora of Tasmania Herbarium (http://demo1.tmag.tas.gov.au/)

It is strongly advised that you consult with state and local experts prior to conducting your surveys. State governments and community groups such as orchid societies are often helpful in such situations. State threatened-species lists may contain species not listed at the national level and vice versa.

These guidelines do not provide guidance on requirements under state and local government laws. Information on state, territory and local government regulations can be obtained from the New South Wales Office of Environment and Heritage; the Queensland Department of Environment and Heritage Protection, Parks and Wildlife; the Northern Territory Department of Land Resource Management or the Parks and Wildlife Commission NT; the Victorian Department of Environment and Primary Industries; the South Australian Department of Environment, Water and Natural Resources; the Australian Capital Territory Environment and

Sustainable Development Directorate; the Tasmanian Department of Primary Industry, Parks, Water and Environment; and local councils in or near the proposed project area.

1.1 Key characteristics of orchids

Orchids are diverse in form, are widely distributed and adapted to a variety of habitats. Their specificity to particular environmental conditions and sensitivity to habitat changes makes orchids excellent indicators of ecosystem health and effectiveness of conservation work.

Orchids have a collective suite of characteristics that can be used to identify them. These can include:

- a highly modified third petal known as a labellum, the exception being the sun orchids (*Thelymitra*) where all petals are about the same size and shape
- highly modified stamens and style fused into a column—this organ is situated centrally on the flower and is often quite conspicuous
- pollen aggregated into packets known as pollinia, each of which can contain thousands of pollen grains—these are dispersed by pollinators as one unit except in the case of the greenhoods (*Pterostylis*) where the pollen can be in granulate clusters
- upside-down flowers with the labellum below the column: in a few genera, such as the leek orchids (*Prasophyllum*) and duck orchids (*Paracaleana*), the labellum is above the column
- dust-like seeds which are barely one millimetre across, often lacking food reserves and usually relying on a beneficial fungus for germination and growth particularly in orchids lacking conspicuous chlorophyll
- the production of a protocorm (a tuberous mass of cells) upon germination from an un-differentiated pro-embryo contained in the seed (some non-orchid *Lobelia* species also produced protocorm-like bodies from their seeds)
- unusual life cycles compared to most other plants—orchid seeds can germinate and grow first into a protocorm, then a seedling with a leaf and finally a mature flowering plant with a leaf/leaves and tuber (underground potato-like structure); this can take up to three or more years depending on the growing conditions of the orchid involved
- a varying capacity to grow tubers as some produce only one while others produce two or more each year: orchids that multiply through the development of multiple new tubers often form large colonies, however, most orchids do not multiply this way and instead rely on seed germination to increase their numbers.

1.2 Survey challenges

Surveying for cryptic species such as orchids presents many challenges.

1.2.1 Response to the environmental conditions

- Most terrestrial orchids remain dormant, in the form of an underground tuber, for up to six months of the year when they cannot be detected during surveys. Some terrestrial orchid species have the potential to survive for up to three years before more favourable environmental conditions allow for them to emerge.
- Orchids may not respond immediately to seasonal conditions such as recent rain.
- The flowering of most winter and spring flowering southern terrestrial orchids is triggered by late autumn and winter rains. In prolonged droughts they may not appear at all, or if leaves do appear they may be very small or wither before flowering or the young flower spike may abort. The failure to find orchids in drought years or when rainfall events do not occur at the right time does not necessarily mean that they are truly absent.

- The proportion of flowering to non-flowering plants is influenced by environmental conditions; therefore, the species may be present but overlooked when only non-flowering plants are present. In addition, not all plants in a population or different populations are likely to flower at the same time.
- Once mature, most southern terrestrial orchids are dormant in summer, surviving as an underground tuber from which they re-sprout in autumn following the onset of rain and a drop in temperature. These orchids will only be visible above ground while in active growth. A feature of these orchids is their capacity to persist underground for one or more years as tubers without producing above-ground parts. This is most common in the drier, inland regions and makes surveys of some rare orchids difficult as more plants are dormant, rather than flowering, most years.

1.2.2 Flowering

- Most orchids flower over a short period, usually in the order of weeks. Some flower only for a few days, making detectability dependent on the accurate timing of surveys. The exceptions are those few species with distinctive leaves (such as *Drakaea elastica*) that are recognisable over a longer period.
- Surveys early or late in the flowering period may miss those plants that are in bud or have finished flowering. For most species several surveys are required during the species' flowering period to pick up all plants.
- Some species only flower after certain disturbance events, notably summer fire.
- Most orchids do not flower every year and in any population there may be more vegetative plants than flowering plants. This means flowering plants will be in different places each year.

1.2.3 Life history

- Some species are extremely difficult to find, such as subterranean or very small orchids. For example, in *Rhizanthella gardneri* (Western Australian Underground Orchid) and *R. slateri* (Eastern Underground Orchid), the tips of the involucral bracts break the surface of the soil but are still hidden under the leaf and bark litter, making plants almost impossible to see. These orchids require very careful searches and specialist knowledge of the species.
- Identification can be complicated by the occurrence of natural hybridisation and variation in floral morphology. Some species may co-occur with closely related species with which they could be mistaken and require specialist skills to identify. Surveys for these species may not locate them or they may be recorded in much higher numbers if confused with a more common species.
- When underground tubers re-sprout, leaves usually emerge many months before flowering. The leaves may be difficult to distinguish from other vegetation and, when found, difficult to identify to species level.
- Orchid seedlings are very small for the first growing season and are difficult to locate and identify. Seedling leaves are typically less than 20 millimetres long and only a few millimetres wide.
- Many threatened orchid species occupy specific habitats. Knowledge and survey of the appropriate habitat is required to locate them.
- Some animals eat orchid leaves, flower buds and/or flower heads. Losses of plant parts can affect detection.

2. DETECTABILITY AND SURVEY CONSIDERATIONS

Detectability is defined as the probability of detecting the target species during the survey of a site at which it is present. Detectability is an important aspect of survey methodologies, with observed absence often treated as a true absence, ignoring the possibility that a species was present but just not detected (Cypher 2002, MacKenzie 2002, Royle & Nichols 2003, Cunningham & Lindenmayer 2005, MacKenzie et al. 2005).

When the target species is present at the site being surveyed, detection can be thought of as a result of two processes: first, the observer encounters the species; and second, the observer sees or identifies the species. Whether an observer encounters an orchid is influenced by the abundance, density and distribution of the species at the site—the larger the population size the more likely the observer is to encounter an individual.

The probability of the observer seeing and/or identifying the orchid is influenced by factors such as morphology or lifeform, observer (level of training, education, experience, interest, eyesight, height, fatigue level or number of surveyors), sampling strategy, habitat quality, and climatic variables at the time of survey (wind speed, temperature, precipitation, time of sunrise, time of day). Other factors that may influence detectability include habitat type, season of year, vegetation height and density, human disturbance or cloud cover (Garrard & Wintle 2011 and references therein). These detectability aspects must be considered when undertaking the survey.

When carrying out a survey, all appropriate steps should be taken to maximise detectability and consider detectability in the analysis and reporting. Some species are always cryptic, while others may be hard to find during certain life stages. If the target species is considered to be too cryptic to be adequately surveyed, it may be more appropriate to assume presence. It must be noted that although the species itself may be cryptic, signs may be relatively easy to find and can often be a good surrogate (or proxy) for presence.

The precautionary principle

Many decisions under the EPBC Act are guided by the principles of ecologically sustainable development (section 3A). One of these principles (s. 3A(b)) is commonly known as the precautionary principle:

“if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation”.

This principle is particularly relevant to assessing the impacts of actions on cryptic species such as orchids. In general, the department will assume that an orchid species known from the region is present on a site unless a robust evaluation has been undertaken to support the case that the species is absent. A robust evaluation could involve application of these survey guidelines, other survey techniques, including a state’s guidelines or accepted industry guidelines, or drawing on relevant expertise.

3. PLANNING CONSIDERATIONS

3.1 Select appropriate personnel to conduct surveys

An essential component of any survey is experienced personnel. Experienced surveyors increase field detection and reduce false ‘negatives’ and ‘positives’ as well as significantly increasing the efficiency of surveys and the reliability of results. In the case of orchids, experienced experts may be required in order to address issues such as identification.

Surveys should be conducted by experienced observers with appropriate experience and qualifications such as:

- demonstrated experience as a field botanist including knowledge of designing and implementing surveys

- experience in field identification of the threatened orchid species and similar species that might be encountered in the area
- having encountered the target species growing in its natural habitat (although team members can be trained to recognise target species using photographs and/or herbarium specimens, it is still preferable that at least one member who has seen the species growing in the wild accompanies field teams at all times). Recent experience of the target species that occur in similar habitats to those being investigated is also of benefit when surveying orchids
- the ability to anticipate potential identification issues and consult with specialists, when necessary, to understand and flag them for resolution (if there is any uncertainty regarding identification of a plant species including threatened species, consultation with local orchid experts should be sought)
- desire to conduct field surveys and the physical capability to work in the terrain involved
- understanding of the legislative regulations and permits required.
- inexperienced surveyors should be taking photographs to show to experts or taking specimens if enough individuals are found.

3.2 Identify species that are likely to or may occur in the study area

Pre-planning of threatened terrestrial orchid surveys should include a thorough examination of existing information to assist with survey design, including the identification of threatened orchids that occur in the survey area, best times to survey, occupancy patterns and habitat, and the most appropriate techniques for particular orchids, if available.

An initial strategy for the desktop review is suggested below.

(i) Characterise the survey area

The boundaries of the survey area must be clearly established. A detailed map of the survey area should show the type, location and broad condition of native vegetation and important habitat features for orchids. This characterisation is not only critical to establishing which threatened species may occur in the area, but also in the selection of appropriate survey methods and effort. An appropriate map will aid almost every survey regardless of survey technique. However, this map should be used only as a guide as a desktop survey will not determine the ground cover condition or detailed habitat features which are both important factors influencing the presence of terrestrial orchids.

(ii) Establish the regional context

This stage requires an assessment of the habitat frequency and function. However, the desktop survey does not assess the distribution of microhabitats which are essential for many terrestrial orchids. The regional context will help develop judgements of significance associated with the loss or disturbance of habitat. A useful test will involve the following questions:

- Is the habitat rare or common?
- Is the habitat likely to be permanent or ephemeral?
- Is the habitat likely to be ‘habitat critical to the survival of the species’?
- Is the habitat likely to comprise an important population?

(iii) Identify those threatened orchids that are known to, likely to, or may, occur in the survey area

This stage involves consulting a range of sources to determine which threatened orchids could occur in the habitat surrounding and including the study area. There are a range of sources that should be consulted to create a list of species. These include:

- databases maintained by the Australian Government Department of Environment, including the Species Profile and Threats (SPRAT) database and the Protected Matters Search Tool (see information box below)
- state and territory conservation agencies and local government databases and predictive models
- national and state/territory threatened species recovery plans and teams
- reference books including orchid-identification guides
- herbarium and other specimen collections
- previously published or unpublished flora surveys, field studies and environmental impact reports
- aerial photographs and satellite images, topographic maps, vegetation maps, geological maps and soils maps
- historic records of flora and vegetation communities in the area
- lists of threatened species, populations or ecological communities in the area
- literature about the ecology of the species, communities and habitats found or likely to be found in the area (species profiles, scientific papers)
- consultation with local community groups, researchers and orchid experts.

The Protected Matters Search Tool (PMST)

- The PMST generates reports that help to determine whether matters of national environmental significance or other matters protected by the Environment Protection and Biodiversity Conservation Act are likely to occur in the area of a proposed action. The reports can be generated using a drawn polygon, coordinates or region. When referring to nationally-listed threatened or migratory species, three terms are used to indicate the likelihood of occurrence of a species, or species' habitat:

1. **known** to occur
2. **likely** to occur
3. **may** occur.

- The likelihood rating assigned to various listed species in the action footprint is one source of information to assess whether targeted ecological surveys are required.
- NB: When generating a PMST report a broad view of action and impacts must be taken to account for indirect, downstream and facilitated impacts. See Significant Impact Guidelines 1.1 for further information. If the report is not generated for all relevant areas, results cannot be considered as indicative of the matter of national environmental significance that may be affected.

When surveys are undertaken outside the optimal survey period, the desktop report would include a predictive list that is dependent on the species records in databases and other (un)published sources. Consultation with the data collector (if possible) and/or local experts is recommended.

There are some instances where it may be considered unlikely that a species is present, but the available desktop or expert information is not adequate to justify a claim of absence. In this situation it may be cost-effective to carry out a survey to confirm absence so that unnecessary mitigation measures are not required.

If the data for the project area are found to be inadequate, or deficiencies in the information required to determine the significance of impacts are identified, the decision must then be made whether to carry out surveys or assume presence. Targeted surveys will be required to assist in the decision-making process (larger volume or better quality information allows for more confidence in decisions).

3.3 Determine optimal timing for surveys of 'target' species

Modelling of survey effort for cryptic plant species such as terrestrial orchids shows the importance of conducting surveys under appropriate survey conditions (or avoiding sub-optimal conditions) (Garrard et al. 2008). Table 1 provides information on peak detectability of particular orchids listed under the EPBC Act. The flowering times in this document should be taken as a guide only because there are always exceptions to the rules. However, we have drawn on as much published information and expert knowledge as possible. Orchids are usually not recorded when surveys are conducted outside optimal periods for their detection. Therefore, the timing of fieldwork is critical to the surveying and reporting process for this flora as well as increasing the confidence in survey results and assessment of significance. However, if proponents are unable to conduct surveys at the appropriate times, the species should be presumed to be present.

With some exceptions (species which can be identified from their leaves) the optimal recommended time to survey for terrestrial orchids is during their flowering period as the presence of flowers makes the species easier to locate and flowers enable positive identification. Often, as some plants will flower before others, several surveys are required to locate all flowering plants over the species' flowering period. A survey conducted when some mature individuals are in bud is acceptable provided the locations of discovered leaves or rosettes are marked for positive identification during the flowering period. In some cases, surveys taken when leaves or rosettes are present (without flower stalks) are acceptable, but only if undertaken by an orchid expert who is familiar with the species and the species has distinctive leaves that are readily identifiable. However, many species cannot be uniquely identified from leaves only.

Surveying for terrestrial orchids should not be undertaken during the dormant period when plants have lost their leaves and are present only as underground tubers and, therefore, would not provide an acceptable identification or indication of the presence or absence of the orchid. If surveys are conducted at an inappropriate time of year (summer for southern Australian terrestrial orchids and winter for northern Australian orchids), the survey results would not be considered to be adequate evidence of a species' absence. Some species have known seasonal variation in presence. In such a case it will be assumed that the species is present.

In some cases survey timing may be able to take advantage of opportunistic disturbance conditions. Most terrestrial orchids are not affected by, or respond favourably to, summer fire when they are dormant, but they are adversely affected if it occurs during their active growing period. Finding orchids post-fire is therefore highly dependent on the time of the fire. For some species this may be the best time to conduct a survey.

In contrast to terrestrial orchids, epiphytic and lithophytic orchids can generally be seen and identified relatively easily at any time of the year.

An important consideration when surveying orchids in an area is that the optimal survey period for each species may differ in terms of:

- length of flowering time
- time of year and seasonality
- weather conditions and climatic variability
- disturbances prior to or during the survey
- density changes in over-storey vegetation
- changes in hydrology of the area
- fire history, logging, grazing, and weed-infestation history
- condition of the vegetation community.

When designing the survey, careful consideration should be given to all the above factors.

3.4 Determine optimal location of surveys

Targeted surveys for threatened orchid species should be carried out on sites that are known to, or may, support orchid populations, orchid microhabitats and within potential orchid habitats.

An effective strategy to maximise the likelihood of detecting a particular orchid species is to target search efforts within habitat favoured by that species (Resources Inventory Committee 1998). This approach relies on the habitat preferences of target species being adequately known, which for many threatened species may not be the case. The fewer the number of habitat-association records reported for a species, the more likely it is that any apparent habitat preference will be an artefact of the small sample size. Furthermore, subsequent surveys tend to focus on these apparently preferred habitats, which can further distort the perception of habitat preference. Consequently, investigators should not exclude particular habitat strata from survey designs unless it is well established that these habitat types are consistently less favoured by the target species than other types within the study area. In addition, the presence of all, or any, suitable habitat and associated species may indicate the presence of some ecological conditions that could be associated with the orchid (Dell & Bester 2006).

All vegetation communities considered to be habitat for the target species should be searched, noting variation in vegetation, canopy coverage, under-storey condition and orchid microhabitat indicators. Both open and closed habitat as well as areas of disturbance should be included where habitat limitations are not already known. Table 1 provides broad-scale information of likely habitats for orchids listed in the EPBC Act. These habitat descriptions are broad; therefore, advice should be sought from orchid specialists in the region to narrow the survey area so as to optimise the survey effort and increase the likelihood of detecting the orchid(s).

Where a threatened orchid has been reliably recorded in the vicinity of the survey site, a detailed survey should be conducted to confirm the extent of the population on the site and in adjacent areas.

3.5 Establish sampling design and survey effort

Orchids are often found sporadically scattered throughout habitat or found in micro-habitats. Quadrat or transect-based surveys are considered inadequate as they may miss these scattered occurrences. In addition, some orchid species are found naturally in very low numbers/densities and so it is difficult to detect them without significant survey effort. Survey

for these species may fail to find them even if they are present unless carried out by people with knowledge of the biology and ecology of the species.

Surveys should be undertaken when the nearest known population of the target orchid is flowering to maximise the likelihood of detecting target orchid plants present on the survey site (J Briggs 2011, pers. comm.,). It is also recommended that surveyors visit other known populations nearby to become familiar with the appearance of the target species and its habitat.

It must be noted that a survey should never be approached with a bias or be carried out in a manner likely to influence the results. Surveys should be carried out in line with the department's survey guidelines for threatened species (or provide justification why not) considering detectability and its implications. Use of a habitat surrogate or proxy has been suggested as a viable alternative to extensive surveys. However, this technique relies on a well-developed knowledge of the species' ecology and habitat requirements. Some species are not well-studied or have ongoing knowledge gaps in their habitat requirements or movements. In such cases, use of a habitat proxy may not be considered a robust enough approach and surveys are likely to be required to inform future decisions on the significance of impacts.

3.5.1 Survey effort

Survey effort is a measure of the effort expended during a survey and may refer to the number of visits made to a site or the duration of survey visits. In simple terms, effort = time x people.

An important note about allocating effort in ecological surveys is that, in many cases, a trade-off must be made between minimising the chance of false absences and maximising the efficiency of the survey given budgetary or time constraints. Terrestrial orchids are cryptic in that they 'disappear' and 'reappear' on a site over time, often remaining underground or inconspicuous at a site for long periods of time and only flower for very short periods. Replicated sampling will often be required either to reveal the target species/taxon or adequately justify claims that the taxon is absent or occurs at very low abundance within the study area. Sampling can be replicated in space (different locations at the same time), time (same location at different times), a combination of both (different locations at different times) or with use of several surveyors. Results from a failure-time analysis method (Garrard et al. 2008) indicate that for species with low occupancy, the duration for the survey will need to be significantly longer than for a more common species. Extra resources may be needed to determine a realistic sampling time (Garrard et al. 2008).

3.5.2 Stratification

In some circumstances the study area of interest will be small enough to allow a comprehensive search of the entire area within a reasonable period of time. The size of such a searchable area will depend critically on the nature of the target taxa/taxon and the habitat and topography of the study area. For example, searching for highly cryptic species in dense scrub will take far longer than searching for large, conspicuous species in open grassland. If a comprehensive search is feasible then sampling will not be required and the data collected will be representative of the entire area. In many cases, however, the study area will be too large to permit a complete search within a reasonable time frame, and selective searches or sampling procedures will be required (Bibby et al. 1992; Royle & Nichols 2003).

Many study sites will include a variety of distinct habitat types, especially if the area is extensive. Some of these habitats may be unsuitable for occupancy by the targeted taxa/taxon. An effective strategy to maximise the likelihood of detecting a particular taxon is to concentrate search effort within habitat that is favoured by the targeted taxon (Bibby et al. 1992; Resources Inventory Committee 1998a). This will require the study area to be divided up, or stratified, into regions of similar habitat types.

When stratifying a study area, the area is usually partitioned first on biophysical attributes (e.g. landform, geology, elevation, slope, soil type, aspect, water depth), followed by vegetation structure (e.g. forest, woodland, shrubland, sedgelands). Strata can be pre-determined based on landscape features indicative of habitat which can be derived from topographic maps, aerial photographs that reveal habitat types, or existing vegetation maps. Preliminary assessment of the study area prior to commencing the surveys will be useful to check stratification units and further stratify the area if necessary (Bibby et al. 1992; NSW DEC 2004). In other situations, such as the inundation of vast floodplains, there may be little alternative but to implement a form of stratified sampling based on observation of habitat during the course of the survey.

3.5.3 Sampling

Temporal sampling is particularly relevant when surveying for orchid species, as populations may fluctuate in abundance, occurrence or detectability over time, especially when these fluctuations are unpredictable, which is the case with many orchid species. Replicated sampling will often be required either to reveal the target species or satisfy the argument that the taxon is either absent or occurs at very low abundance within the study area.

For many plant species there may be no be advantage to increasing the number of times particular locations are surveyed, especially when seasonality is taken into account, as in the case of orchids where the peak time of detectability is the flowering season. This is an important consideration when travel costs and other overheads are associated with repeated visits. In such circumstances the probability that a species is detected will depend on the amount of time spent at the survey location. Therefore, it may be more efficient to increase the amount of time spent at survey locations rather than to increase the number of times a location is surveyed (Brown et al. 2004). This latter point will depend on the species being surveyed at its optimal flowering time. If surveyed just once early or late in the flowering period then plants may be missed.

Surveys over multiple years may be required where a single year's data are not adequate to detect the species or to address the environmental factors. As many orchids do not emerge or flower every year (that is, species that flower only following fire or are reliant on good winter rainfall) or can only be identified for a brief period when in flower, it can be difficult to assess the impact of proposed developments through one-off impact assessment surveys. If surveys are undertaken outside optimal survey periods, additional species-specific surveys may need to be undertaken at optimal times.

The most reliable way to demonstrate that the surveys were conducted at an appropriate time is to coincide the survey with the flowering time of another known nearby population of the target species. The extent of the flowering within the known population compared to other years will give an indication of how favourable the current season is and thus whether, although surveyed at flowering time, there was still a low possibility of detection due to poor seasonal conditions.

4. MINIMAL SURVEY REQUIREMENTS FOR TERRESTRIAL ORCHIDS

Given the cryptic nature of terrestrial orchids and their often rare, scattered appearance in bushland, quadrat-based surveys or meandering searches alone are not considered to be an adequate survey technique. However, a random 'meander' survey may be conducted initially during the flowering period to ascertain the presence of the orchid species. This is to cover large areas of potential habitat if the species has not been detected previously at the site. Records are taken using GPS and on-ground markers along transects where the target species is located. A more thorough search should then be undertaken in the vicinity of plants detected using area search and targeted parallel transects.

4.1 Area search

The area search is an effective method for detecting many orchid species, regardless of whether the study area is small enough to permit a complete search or whether sampling of a larger site is required. Area searches usually involve searching a plot of predetermined size for a predetermined period of time. The ideal amount of time that is allocated to search plots of a given size will depend on the aim of the search and the habitat type. Each selected area is searched systematically. Area searches should also take into consideration optimal habitat for the targeted species. The larger the area of habitat that will be impacted, the larger the survey effort needed to ensure a representative sample is gathered. Larger surveys generally equate to higher cost. In this case it may be appropriate to assume that a species is present rather than survey for it.

Longer times increase the number of species detected at each point location, and increase the probability of detecting more cryptic species. Free movement through an area allows the investigator to explore more thoroughly any indicative signs or favoured habitat features than other more structured searches such as transects and point counts. Furthermore, the shape of the sample area can usually be tailored easily to target preferred habitat compared with transect methods.

4.1.1 Systematic targeted search parallel transects

Orchid plants can be difficult to see from any distance away particularly by inexperienced searchers. Individual observers should systematically traverse the survey site in parallel transects five to 10 metres apart. Transect separation will depend on the density of vegetation and the size of the target species. Experienced searchers will be able to identify microhabitats more likely to contain the orchid. When some orchids are found, more may often be discovered nearby. However, some orchids occur as scattered individuals or discrete clumps, sometimes separated by large distances. Sometimes a small number is all that is present in an area.

Once the species is detected, or there are known areas where the species has previously occurred, targeted surveys should be conducted along parallel line transects approximately five to 10 metres apart, depending on the visibility of the orchid and the density of vegetation (J Briggs 2011, pers. comm.,). Searches are conducted on foot and are focused between two-and-a-half and five metres either side of each transect walked (it is not easy to detect most orchid species more than five metres away). In some cases, recognition of the orchid requires the observer to be virtually on top of the plants. Distances between transects greater than 10 metres apart often will fail to detect plants.

In potential habitat for the species, transects should be walked at six metre intervals, searching within three metres on either side. All suitable native vegetation within 500 metres of known and historical populations should be surveyed.

Transect surveys usually involve recording the orchid while travelling a pre-determined path between two fixed points of known distance apart. Alternatively, transects may be travelled for a fixed period of time without regard for distance. Transects are typically conducted along a straight path, but can follow roads, rivers, coastlines or contours. Transect lengths may be variable and dictated by the dimensions of patches of habitat favoured by the target species/taxon. Transects should be conducted at a speed appropriate for the habitat and purpose of the study. Generally, the number of detected species will increase with slower travel speed because there will be more time to detect less conspicuous species. Consequently, the optimal travel speed will be a trade-off between covering as much terrain as possible and detecting individuals of the target species. Increasing the time spent searching per survey is more likely to detect a target plant species (Garrard et al. 2008).

4.1.2 Minimal survey requirements for epiphytic and/or lithophytic orchid species

The minimal survey methodology for epiphytic and lithophytic species includes the random meander and systematic transects techniques. The random meander (Cropper 1993) covers areas that appear likely to have rare species, based on habitat and the judgement of the investigator. This technique involves traversing the entire survey site and recording any species. This survey methodology, prescribed by Cropper (1993), is considered appropriate for this type of work.

5. DOCUMENT SURVEY METHODS AND RESULTS

Survey methods and level of search effort vary widely between studies. For this reason it is essential that survey reports include detailed information on the methods used and the level of search effort adopted. This should include who was involved, what work was carried out and where, when the survey was conducted (both date and time of day) and how the survey was conducted, as well as the climatic conditions at the time. The survey report should follow the standard aims, methods, results and discussion format common to all scientific research. Without this information it is difficult to interpret the survey results and impossible to replicate the study for comparative purposes (Resources Inventory Committee 1998).

It is useful to record the GPS location of all sampling units and the report must provide maps of the study area as well as a site description. A detailed description of the habitat should also be provided. Information on the condition of the habitat at the time of the survey should be included as this may be useful in later analysis (for example, determining whether species presence/absence is due to temporary factors such as drought) (NSW DEC 2004).

Documentation of all orchid species recorded is essential as it can provide a measure of survey effort and effectiveness. Species that are found need to be identified to species level, not just to genus. There have been cases where the presence of a threatened species was not recognised because of a failure to complete its identification to a species level. Documentation of observers and their skills is also important.

In order to allow a better understanding and interpretation of survey effort, findings should be supported wherever possible by information such as:

- site photos showing the location of transect paths and equipment placement, such as survey grid
- photos/records of habitat present including structure and diversity—these photographs should be taken and shown to an orchid expert for confirmation
- summary tables with measurements, diagnostic observations and photos of orchids (and/or if a sufficient number of individuals are found)
- maps showing the location of planned infrastructure over the top of aerial photographs (ideal) or other geographical layers that represent the habitats present in the area
- a description of how detectability has been addressed.
- In addition, survey data should be made available to Commonwealth (SPRAT@environment.gov.au) state and territory environment departments for inclusion in orchid databases where appropriate.

Reports should also carry some justification of the survey design, whether it is opportunistic, systematic or focused on certain likely habitats. This would include information on the habitat types present and the survey effort given to each. For species that might be present at very low abundance it is important to describe the likelihood of presence based on habitat descriptions made as part of the survey. Explanations on the timing of the survey, suitability of the weather and tabulated duration of transects and recordings should also be given.

The report should detail the location and size of each population found of target orchid species. GPS coordinates must be recorded for centroids of small populations and the boundaries of each larger population must be mapped. The report should also note if any suspected or known non-flowering individuals were observed within confirmed populations.

The significance of any detected populations must be discussed in relation to the total known population and other regional populations. The potential size of detected populations in good flowering seasons should be discussed based on current and previously known sizes of other known populations of the target species.

6. CHECKLIST

Survey design

☐ Have I sought expert advice to optimise the survey effort and detecting the species?

☐ Have I considered the detection probability of the species and the factors that may influence the detection of the species during any survey? Have I recorded these factors?

☐ What technique have I used to survey for the orchids? If different from these guidelines, have I justified the choice of the survey technique?

☐ Have I noted any constraints in the survey design?

☐ Have I included a description of consultation with key stakeholders?

☐ Have I described the data sources I have used and explained how data was handled?

☐ Have I noted the sampling dates, times and weather conditions?

☐ Have I described the survey techniques utilised and the intensity of sampling in each strata?

☐ Have I described the data-analysis methods, including any criteria used to categorise areas of high biodiversity?

☐ Have I considered the national, regional, district and site context of the most effective survey approach?

Survey considerations

Appropriate personnel to conduct surveys

☐ Are the surveys being conducted by appropriately experienced surveyors with suitable experience and qualifications for orchids?

☐ Have I included the details of the surveyors in the report?

☐ Is all field equipment (such as GPS, camera) in working order?

☐ Are all legislative regulations and permits are in place?

☐ If I require orchid identification who have I contacted and what information did I supply them?

Desktop review considerations

☐ Have I prepared a map of the survey area showing its boundaries and type, location and broad condition of the native vegetation and important orchid habitat features?

☐ Have I considered the regional context—habitat type, frequency and function?

- ☐ Is the habitat rare or common?

☐ Is the habitat likely to be permanent or ephemeral?

☐ Is the habitat likely to be habitat critical to the survival of the species?

☐ Is the habitat likely to comprise an important population of a species of orchid?

☐ Have I consulted with relevant information sources to generate a list of threatened orchids that are known to, likely to, or may, occur in the survey area that are identified and documented?

☐ Do I need to consult with federal, state and local government, orchid societies, orchid experts to ensure the list is accurate?

☐ If the data is inadequate have I considered whether to carry out the survey or assume presence. Have I justified this decision?

☐ Have I checked the current taxonomic listing status and name?

Optimal timing for surveys

☐ Have I determined the optimal flowering period for each 'target' species following consultation with published and unpublished reliable information sources?

☐ Have I considered all the factors that can influence the flowering of the species within the known optimal flowering period and put aside necessary lead time to account for these factors?

☐ Have I conducted several surveys to locate flowering periods over the recommended survey period?

☐ Have I noted other considerations when determining the optimal survey period?

☐ Have I put aside sufficient lead-in time to account for optimal detectability in the survey methodology?

☐ If I am conducting the survey outside the optimal survey period what options have I considered and have I justified the methodology?

Optimal location for surveys

☐ Have I described the location and extent of threatened species, populations, ecological communities and their habitat recorded in the study area?

☐ Have I described the vegetation communities such as structure, spatial distribution, conditions, integrity, disturbance regime, hydrology?

☐ If the study requires stratification, how have I partitioned the study area?

☐ Have I described the precise location and layout of the stratification units, quadrats, traverses and sampling sites, vegetation types, and relevant species distribution (presented as grid references and maps)?

☐ Have I provided a description of each stratification unit, the vegetation types in terms of structure and floristics, and a list of the dominant plant species in each growth stratum (trees, under-storey, shrubs and groundcover)?

☐ Have I included a description of the area's disturbance (prior clearing/logging, fire regime, flooding), a description of the weeds present and their density, and comments on the suitability of the area as habitat for species, populations and ecological communities of conservation significance?

☐ Have I surveyed all vegetation communities/microhabitats that are considered habitat for the threatened orchid species?

Survey report considerations

☐ Have I provided a survey report which includes the following: aims, methods, results, discussion?

☐ Have I included information on the survey sheet including:

- a description of the proposal
- site location and description
- the regional context, location, geology, soils, landforms, climate
- disturbance history and other relevant information relating to stratification requirements
- any constraints or limitations on the study
- how the report is structured
- the study's aim and objectives
- dates of survey
- details about the survey personnel qualifications and experience
- references (e.g. map and/or GPS; altitude, slope, aspect)
- habitat description (plant litter, rock, fallen logs, vegetation type, fire history, land use, evidence of weeds/feral animals; soil type, topography, vegetation structure, microhabitats, flora species recorded (in particular targeted species))
- a list of all plant and animal species recorded
- a list of all threatened species, populations, ecological communities recorded or known or likely to occur in the locality
- summaries of the data, including which species were found at which sites, strata vegetation or habitat types, and by which methods they were located
- maps of survey method locations
- any general or unusual observations
- maps of environmental features, vegetation types and habitat types
- results of any modelling or statistical analysis of data
- maps of any areas of high biodiversity or other areas of special significance
- photos of the study area and subject site

- raw data (copies of original data sheets are acceptable) should be included in an appendix
- publications used in the report (cited within the report with author, year of publication, title of publication, journal volume and pages and/or name of publisher).

7. USEFUL REFERENCES

Backhouse, G N & Jeanes, J A 1995, *The Orchids of Victoria*, The Miegunyah Press, Melbourne.

Bates, R J & Weber, J Z 1990, *Orchids of South Australia*., Flora and Fauna of South Australia Handbooks Committee, Adelaide. Bishop, A 1996, *Field Guide to Orchids of New South Wales and Victoria*, University of New South Wales Press, Sydney.

Brown, J, Harris, S & Timmins, S M 2004, 'Estimating the maximum interval between repeat surveys', *Austral Ecology*, vol. 29, pp. 631–6.

Brown, A P, Dundas, P, Dixon, K W & Hopper, S D 2008, *Orchids of Western Australia*, University of Western Australia Press, Perth.

Brown, A P, Thomson-Dans, C & Marchant, N 1998, *Western Australia's threatened flora*, Department of Conservation and Land Management, Perth.

Council of Heads of Australasian Herbaria 2013, Council of Heads of Australasian Herbaria, viewed 15 December 2013, avh.chah.org.au.

Cropper, S C 1993, *Management of Endangered Plants*, CSIRO, Melbourne.

Cunningham, R B & Lindenmayer, D B 2005, 'Modelling count data of rare species: some statistical issues', *Ecology*, vol. 85, pp. 1135–42.

Cypher, E A 2002, *General Rare Plant Survey Guidelines*, California State University, Bakersfield.

Davies, R J P 1986, *Threatened Plant Species of the Mt Lofty Ranges and Kangaroo Island Regions of South Australia*, Conservation Council of South Australia, Adelaide.

Davies, R J P 1992, *Threatened Plants of the Murray Mallee, Mt Lofty Range and Kangaroo Island Region of South Australia*, Conservation Council of South Australia, Adelaide.

Department of Environment and Conservation (New South Wales) 2004, 'Threatened Biodiversity Survey and Assessment: Guidelines for Developments and Activities' (Working draft), Department of Environment and Conservation, Sydney.

Department of Parks and Wildlife (Western Australia) 2013, Department of Parks and Wildlife, viewed 15 December 2013, http://www.dec.wa.gov.au/management-and-protection/threatened-species.

Dell, M D & Bester, L R 2006, *Management and status of Leafy Greenhood* (Pterostylis cucullata) *populations within Mornington Peninsula Shire*, report to Mornington Peninsula Shire Council, Universal Ecology Services, Melbourne.

Garrard, G E, Bekessy, S A, McCarthy, M A & Wintle, B A 2008, 'When have we looked hard enough? A novel method for setting minimum survey effort protocols for flora surveys', *Austral Ecology*, vol. 33, pp. 986–98.

Garrard, G E & Wintle, B A 2011, Minimum survey effort requirements for impact assessments under the EPBC Act 1999; a review of methods for estimating and managing detectability in biological surveys, a report to the Australian Department of Sustainability, Environment, Water, Populations and Communities, Canberra.

Harden, G J (ed.) 1993, *Flora of New South Wales, Volume Four*, UNSW Press, Sydney.

Hoffman, N & Brown, A P 2011, *Orchids of Southwest Australia*, 3rd edn, published by author, Perth.

Jones, D L 2006, *A complete guide to Native Orchids of Australia, including the island Territories*, New Holland Publishers (Australia), Sydney.

Jones, D L, Wapstra, H, Tonelli, P & Harris, S 1999, *The Orchids of Tasmania*, Melbourne University Press.

MacKenzie, D I & Kendall, W L 2002, 'How should detection probability be incorporated into estimates of relative abundance?', *Ecology*, vol. 83, pp. 2387–93.

MacKenzie, D I, Nichols, J D, Sutton, N, Kawanishi, K & Bailey, L L 2005, 'Improving inferences in population studies of rare species that are detected imperfectly', *Ecology*, vol. 86, pp. 1101–13.

MacKenzie, D I, Nichols, J D, Lachman, G B, Droege, S, Royle, J A & Langtimm, C A 2002, 'Estimating site occupancy rates when detection probabilities are less than one', *Ecology*, vol. 83, pp. 2248–55.

Resources Inventory Committee 1998, *Species Inventory Fundamentals: Standards for Components of British Columbia's Biodiversity No. 1*, report prepared by Resources Inventory Branch, Ministry of Environment, Lands and Parks, Vancouver.

Royle, J A & Nichols, J D 2003, 'Estimating abundance from repeated presence-absence data or point counts', *Ecology*, vol. 84, pp. 777–90.

South Australia's Native Orchids 2011, DVD-ROM, Native Orchid Society of South Australia, Adelaide.

State Herbarium of South Australia, *Adelaide Herbarium Database*, data provided to the Commonwealth Department of the Environment, Water, Heritage and the Arts, Canberra, 2009.

Thompson, S K & Seber, G A F 1994, 'Detectability in conventional and adaptive sampling', *Biometrics*, vol. 50, pp. 712–24.

Western Australian Herbarium 1998–, FloraBase—the Western Australian Flora, Department of Parks and Wildlife, Perth, viewed 16 December 2013, http://florabase.dpaw.wa.gov.au/.

Wapstra, M, Roberts, N, Wapstra, H & Wapstra, A 2012, *Flowering Times of Tasmanian Orchids: A Practical Guide for Field Botanists*, self published, Hobart.

ATTACHMENT 1: ORCHID DETECTABILITY INFORMATION

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
Acianthus ledwardii R.Br. (Ledward's mosquito orchid)	Extinct	Queensland	South-east Queensland	Peak flowering period: not specified	Similar species: not specified
Acriopsis emarginata (*javanica*) D.L.Jones & M.A.Clem. (pale chandelier orchid)	Vulnerable	Queensland	Rainforests and swamps growing on trees	Peak flowering period: July to October	Similar species: not specified
Arachnorchis actensis D.L.Jones & M.A.Clem. (Canberra spider orchid)	Critically endangered	ACT	Transitional vegetation zones between open grassy woodland and dry sclerophyll forest. Associated with *Allocasuarina verticillata* at some sites	Vegetative growth: late autumn or early winter following good rains Flower bud production: late winter or early spring Peak flowering period: late September to mid October	Similar species: *Caladenia concinna*
Bulbophyllum globuliforme Nicholls (miniature moss-orchid, hoop pine orchid)	Vulnerable	Queensland, NSW	*B. globuliforme* is host specific, and will only grow on upper branches of the Hoop Pine (*Araucaria cunninghamii*)	Peak flowering period: September to November but also recorded for May and August	Similar species: not specified
Bulbophyllum gracillimum (Rolfe)	Vulnerable	Queensland	Notophyll vine forests growing low on	Peak flowering period: flowering spasmodic, from	Similar species: not

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
wispy umbrella orchid)			rainforest trees usually close to creeks, in shaded, sheltered and constantly humid situations	August through to March with the main flowering period being November to February	specified
Bulbophyllum longiflorum Thouars (pale umbrella orchid)	Vulnerable	Queensland	Notophyll vine forests in wet tropical rainforests. It usually grows on the trunks of rainforest trees, but has also been seen growing on rocks	Peak flowering period: January to March	Similar species: unlikely to be confused with any other Australian species
Caladenia amoena D.L.Jones (charming spider orchid)	Endangered	Victoria	Ridge tops and sheltered slopes in dry sclerophyll forest	Peak flowering period: late August to late September	Similar species: not specified
Caladenia anthracina D.L.Jones (black-tipped spider orchid)	Critically endangered	Tasmania	Grassy eucalypt woodland with *Acacia dealbata* and *Pteridium esculentum* on well-drained sandy soil; areas of low rainfall in the northern midlands	Peak flowering period: late September to early November. A strong peak in flowering in latter half of October	Similar species: not specified
Caladenia arenaria Fitzg. (sand-hill	Endangered	NSW	*Callitris*-covered sandy ridges and	Vegetative growth:	Similar species: *Caladenia colorata*. Part of the *C.*

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
spider-orchid)			dunes, especially in the vicinity of watercourses	autumn to early winter Peak flowering period: late August to early October It flowers best after fires or on disturbed corridors throughout mallee heath	*patersonii* complex. Hybrids with *C. cardiochila* have been observed
Caladenia argocalla D.L.Jones (white-beauty spider-orchid)	Endangered	SA	Open grassy herbland under light, mixed *Eucalypt* and *Callitris* woodland or forest	Vegetative growth/leaf production: April to May Flower-bud formation: mid-August to mid-September Peak flowering period: mid-September, October and early November Flowers profusely without fires	Similar species: albino flowers of the pink-lipped spider-orchid (*Caladenia behrii*); and winter spider-orchid (*C. brumalis*)
Caladenia atroclavia D.L.Jones & M.A.Clem. (black-clubbed spider-orchid)	Endangered	Queensland	Open forest on heavy loams derived from granite	Peak flowering period: October	Similar species: not specified
Caladenia audasii R.S.Rogers (McIvor spider-orchid)	Endangered	Victoria, SA	Variety of woodland and open forest habitats	Peak flowering period: mid-September to mid-October	Similar species: *Caladenia leptochila*

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
Caladenia barbarella Hopper & A.P.Br. (small dragon orchid)	Endangered	WA	Margins of seasonal creek lines and damp lands absent in areas of dense heath or tall scrub of *Melaleuca uncinata* or *Acacia* spp. or more rarely on rocky ledges	Peak flowering period: late August to mid September Poor flowering occurring in dry years Dormant between November and April	Similar species: *Caladenia barorossa*, *C. mesocera* and *C. drakeoides*. However, *C. barbarella* is geographically isolated from these species
Caladenia behrii Schltdl. (pink-lipped spider-orchid)	Endangered	SA	*Eucalyptus* woodlands and forests	Vegetative growth/leaf production: April to August Flower-bud formation: August to September Peak flowering period: late August to October Occurs as small, scattered populations	Similar species: *Caladenia colorata, C. fulva, C. rigida, C. woolcockiorum*
Caladenia brachyscapa G.W.Carr (short spider-orchid)	Extinct	Victoria (extinct) Tasmania (extant)	Heathland and sparse coastal scrub on well-drained sandy loam	Peak flowering period: in mainland Australia is September to November; in Tasmania, late October to early November	Similar species: not specified
Caladenia brumalis D.L.Jones (winter spider-orchid)	Vulnerable	SA	Among grass and shrubs in open forest or sedgeland, light woodland and mallee	Peak flowering period: late June to September	Similar species: *Caladenia argocalla*, *C*. sp. South East, *C. colorata*, *C. fragrantisima*, *C. intuta*. Forms hybrids with

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
			vegetation		*Caladenia latifolia*, *C. macroclavia* and *C. conferta*
Caladenia bryceana R.S.Rogers subsp. *bryceana* (dwarf spider-orchid)	Endangered	WA	Open wandoo woodland to mallee shrubland, often adjacent to watercourses	Peak flowering period: mid August to early October Dormant between late October and late April	Similar species: *Caladenia bryceana* subsp. *cracens* and other members of the *Caladenia roei* complex. Note that *Caladenia bryceana* subsp. *cracens* is geographically isolated from the subspecies *cracens* and occurs in habitat where most other related species are absent
Caladenia bryceana subsp. *cracens* Hopper & A.P.Br. (northern dwarf spider-orchid)	Vulnerable	WA	Low heath in shallow soil pockets on coastal limestone hills; winter-moist flats or in swales beneath thickets of broom bush (*Melaleuca uncinata*). Northern populations are found in tall open shrubland will mallee on deep red sand	Peak flowering period: mid August to early September Dormant between late October and late April	Similar species: *Caladenia bryceana* subsp*. bryceana*, members of the *Caladenia roei* complex. Note that *Caladenia bryceana* subsp. *cracens* is geographically isolated from these species and occurs in different habitat.
Caladenia busselliana Hopper & A.P.Br. (Bussell's	Endangered	WA	In marri (*Eucalyptus calophylla*) and jarrah (*E. marginata*)	Peak flowering period: mid September late to October	Similar species: Dunsborough Spider-orchid, *Caladenia*

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
spider-orchid)			woodland often on the margins of winter-wet swamps	Dormant between late November to late April Flowering is stimulated by summer fires with fewer flowering plant found other years	*paludosa* (swamp spider-orchid), *Caladenia huegelii* group
Caladenia caesarea subsp. *maritima* Hopper & A.P.Br. (cape spider-orchid)	Endangered	WA	In shallow soil on coastal granite outcrops	Peak flowering period: August to early September Dormant between late October and late April The flowers are strongly metallic scented. Plants flower most years	Similar species: *Caladenia luteola*. Differs from the typical subspecies in having an earlier flowering period, smaller flowers and a coastal distribution
Caladenia calcicola G.W.Carr (limestone spider-orchid)	Vulnerable	Victoria, SA	In open forest and woodland on low ridges overlaying limestone	Peak flowering period: mid September to early November with an early to mid-October peak	Similar species: *Caladenia hastata, C reticulata, C. valida, C. stellata, C. lowanensis, C. cruciformis*. Frequent hybridation occurs
Caladenia campbellii D.L.Jones (thick-stem caladenia)	Critically endangered	Tasmania	Slopes and ridges on rolling hills among shrubs in stunted coastal and near-coastal scrub	Peak flowering period: October and November (particularly around 1 to 15 November)	Similar species: *Caladenia alata*
Caladenia carnea var. *subulata*	Endangered	Victoria	In damper forest,	Peak flowering period:	Similar species: *Caladenia coactilis, C. fuscata, C.*

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
Nicholls (striped pink-fingers)			woodland and scrubs	October to November Known to occur after site disturbance	*ornata, C. prolata, C. vulgaris*
Caladenia caudata Nicholls (tailed spider-orchid)	Vulnerable	Tasmania	Heathy eucalypt forest and woodland, often with sheoaks, and heathland on sandy and loamy soils; often found on sunny north-facing sites	Peak flowering period: plants on the east coast have been recorded flowering as early as August but with the main season being September. In the northern and north-western part of the state the flowering period is October to November This species responds with prolific flowering the first season after a hot fire, diminishing to few or none in subsequent seasons Can be hard to detect in its often dried-off grassy habitat	Similar species: not specified
Caladenia christineae Hopper & A.P.Br. (Christine's spider orchid)	Vulnerable	WA	Margins of winter-wet flats and freshwater lakes, often under *Melaleuca* species or mixed jarrah/marri forest	Peak flowering period: mid September to early November Dormant between December to late April Summer fires stimulate	Similar species: *Caladenia harringtoniae*, *C. longicauda* subsp. *redacta*. Occasionally hybridises with *C. harringtoniae*

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
				flowering, and many populations have been found in flower only in the year after a summer fire	
Caladenia colorata D.L.Jones (coloured spider-orchid)	Endangered	SA	Mostly in *Callitris* or blue gum woodlands, sandy, fertile soils but also in rock outcrops and in mallee/broombush associations	Vegetative growth: late May to early June Peak flowering period: August to early October	Similar species: *Caladenia behrii, C. brumalis, C. concolor, C. fulva, C. rosella, C. woolcockiorum*
Caladenia concolor Fitzg. (crimson spider-orchid)	Vulnerable	NSW, SA, Victoria	Variety of woodland and open forest habitats (usually within Box-Ironbark ecosystems) often among low heathy shrubs	Peak flowering period: September and October	Similar species: *Caladenia rosella, C. oenochila*
Caladenia conferta D.L.Jones (coast spider-orchid)	Endangered	SA	Mallee woodlands or broombush on rock outcrops, favouring bare, open sites	Peak flowering period: July to September Occurs in areas of reliable winter rainfall	Similar species: *Caladenia toxochila*. Forms sporadic hybrids with *C. brumalis*.
Caladenia cremna (D.L.Jones) G.N.Backh. (Don's spider orchid)	Critically endangered	Victoria	Heathy dry forest	Peak flowering period: not specified	Similar species: not specified

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
Caladenia dienema D.L.Jones (windswept spider-orchid)	Endangered	Tasmania	Windswept low heathland, growing among dwarfed shrubs and sedges on moist to well-drained sandy and clay loams; usually associated with rocky outcrops but may also extend into shrubby forests, usually dominated by *Eucalyptus obliqua*	Peak flowering period: late October to early November	Similar species: not specified
Caladenia dorrienii Domin (Cossack spider-orchid) Syn. *Calonema dorrienii* (Domin) Szlach.	Endangered	WA	Open wandoo (*Eucalyptus* wandoo)/jarrah (*E. marginata*)/*E. rudis* woodland	Peak flowering period: mid September to early November Dormant between December and late April	Similar species: *Caladenia vulgata*
Caladenia drakeoides Hopper & A.P.Br. (hinged dragon orchid)	Endangered	WA	Margins of salt lakes and flats beneath scrub	Peak flowering period: late August to early October Dormant between late October and late April	Similar species: *Caladenia barbarosiae, C. mesocera, C. barbarella* *Caladenia drakeoides* occasionally co-occurs with *C. mesocera*
Caladenia elegans Hopper & A.P.Br. (elegant spider-	Endangered	WA	Grows among scattered *Acacia*, *Melaleuca* and	Peak flowering period: late July to mid August	Similar species: *Caladenia vulgata*. *Caladenia elegans* often co-occurs

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
orchid)			*Grevillea* species in the winter-wet depressions. Some populations are found on slopes and hillsides	Dormant between October and late April	and hybridises with *Caladenia vulgata* in some areas forming hybrid swarms
Caladenia excelsa Hopper & A.P.Br. (giant spider-orchid)	Endangered	WA	In sandy soils in banksia, jarrah (*Eucalyptus marginata*) and marri (*Corymbia calophylla*) woodlands	Peak flowering period: late September to early November Dormant between December and late April	Similar species: *Caladenia longicauda*
Caladenia formosa G.W.Carr (elegant spider-orchid)	Vulnerable	Victoria, SA	Diverse range of habitats including river red-gum flats, limestone hillocks and sandy heath-land. *Eucalyptus leucoxylon* (yellow gum) and *E. microcarpa* (grey box) with a low, somewhat open shrubby under-storey	Peak flowering period: September and October	Similar species: *Caladenia concolor*, *C. colorata*. Forms hybrids with other members of the *C. patersonii* complex
Caladenia fulva G.W.Carr (tawny spider-orchid)	Endangered	Victoria, SA	Woodlands dominated by *Eucalyptus leucoxylon* sens. lat. with open under-	Peak flowering period: September to early October	Similar species: can be confused with *Caladenia behrii* and *C. formosa*. Member of the *C. patersonii* complex

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
			storey		
Caladenia gladiolata R.S.Rogers (bayonet spider-orchid)	Endangered	SA	Woodland, grassland and grassy, open forest	Vegetative growth: May to June Flower-bud formation: July to September Peak flowering period: late August to early November	Similar species: *Caladenia toxochila* (bow-lip spider-orchid); *C. longiclavata* (clubbed spider-orchid). Forms hybrids with the star spider-orchid (*Caladenia saxatilis*), the sand spider-orchid (*C. flindersica*), the greencomb spider-orchid (*C. tensa*), and the mount remarkable spider-orchid (*C. woolcockiorum*). This occurs particularly following disturbance
Caladenia harringtoniae Hopper & A.P.Br. (Harrington's spider-orchid)	Vulnerable	WA	Paperbark (*Melaleuca* spp.) and flooded gum (*Eucalyptus rudis*) swamps and flats and along creek lines in jarrah (*Eucalyptus marginata*) and karri (*Eucalyptus diversicolor*) forest	Peak flowering period: late September to early November Dormant between December and late April Summer fires often stimulate flowering	Similar species: *Caladenia startiorum, C. winfieldii; C. christineae* Occasionally hydridises with *C. christineae*
Caladenia hastata (Nicholls) Rupp (Melblom's spider-	Endangered	Victoria, SA	Dense coastal heathland and heathy woodland on flat, seasonally	Peak flowering period: mid-October to late November	Similar species: not specified

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
orchid)			waterlogged sites	Summer fires promoting flowering for several seasons	
Caladenia hoffmanii Hopper & A.P.Br. (Hoffman's spider-orchid)	Endangered	WA	On the tops and slopes of rocky hills growing in woodland and heath communities. Populations also found in winter-wet depressions	Peak flowering period: mid August mid September Dormant between late October and late April	Similar species: *Caladenia graniticola*. Note the two species are geographically isolated
Caladenia huegelii Rchb.f. (king spider-orchid)	Endangered	WA	Mixed banksia/jarrah woodlands	Peak flowering period: mid September to October Dormant between late November and late April	Similar species: *Caladenia paludosa, C. arenicola, C. thinicola, C. georgei*
Caladenia insularis G.W.Carr (French Island spider-orchid)	Vulnerable	Victoria	Dense wet heathland or heathy woodland	Peak flowering period: September and October	Similar species: not specified
Caladenia intuta (D.L.Jones) R.J.Bates (ghost spider-orchid)	Critically endangered	SA	Mallee Box (*Eucalyptus porosa*)—drooping sheoak (*Allocasuarina verticillata*) woodland	Vegetative growth: July to August Flower-bud formation: early to late August Peak flowering period: late August to mid September	Similar species: *Caladenia brumalis, C. rigida*

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
Caladenia lindleyana (Rchb.f.) M.A.Clem. & D.L.Jones (Lindley's spider-orchid)	Critically endangered	Tasmania	Lowland open eucalypt forest and woodland. The species' potential habitat is poorly understood	Peak flowering period: form mid October to early November in the northern midlands	Similar species: *Caladenia patersonii*
Caladenia lodgean (Lodge's spider-orchid)	Critically endangered	Western Australia	Seasonally moist to wet clay on the margins of rock outcrops in low scrub; and seasonally wet sand on the margins of ephemeral wetlands in open forest	Peak flowering period: mid September to October (Collie area) and late October to early December (Augusta area)	Similar species: not specified
Caladenia lowanensis G.W.Carr (Wimmera spider-orchid)	Endangered	Victoria, SA	Woodlands dominated by *Eucalyptus leucoxylon* sens. lat. and *Callitris gracilis*	Peak flowering period: September and October	Similar species: not specified
Caladenia macroclavia D.L.Jones (large-club spider-orchid)	Endangered	SA	Mallee-broombrush woodland	Vegetative growth: May to June Flower-bud formation: July to September Peak flowering period: late August to early	Similar species: *Caladenia dilatata*, *C. stricta* and *C. verrucosa*; hybrids *with C. stricta* and *C. vurrucosa*. Hybrids rarely seen with *C. brumalis* (winter spider-orchid) and *C.*

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
				November Usually present where other orchids are numerous	*fragrantissima* (scented spider-orchid)
Caladenia melanema Hopper & A.P.Br. (ballerina orchid)	Critically endangered	WA	Swamp mallet (*Eucalyptus spathulata*), and *Melaleuca* scrub on rises above salt lakes and flats	Peak flowering period: August to mid September Dormant between October and late April	Similar species: *Caladenia dimidia, C. vulgata*
*Caladenia orientalis (*G.W.Carr) Hopper & A.P.Br. (cream spider-orchid)	Endangered	Victoria	Coastal heathland and heathy woodland	Peak flowering period: one or two flowers between September–October and early November–December	Similar species: not specified
Caladenia ornata (Nicholls) D.L.Jones (ornate pink fingers)	Vulnerable	Victoria, SA	Seasonally inundated heathlands, woodlands and heathy woodlands	Peak flowering period: mainly in October sometimes as late as December Occurs as sparse individuals and small clumps	Similar species: *Caladenia carnea, C. coactilis, C. fuscata, C. vulgaris*
Caladenia ovata R.S.Rogers (Kangaroo Island spider-orchid)	Vulnerable	SA	Brown stringybark (*Eucalyptus baxteri*) tall shrubland and tall open-shrubland in a medium-	Peak flowering period: late September and in October Seldom flowers except	Similar species: narrow lipped spider-orchid (*Caladenia leptochila*); hybridisation between narrow lipped spider-

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
			density under-storey	after bushfires	orchid and the Kangaroo Island spider-orchid
Caladenia pallida Lindl. (rosy spider-orchid)	Critically endangered	Tasmania	Open eucalypt forest in lowland areas with annual rainfall less than 1000 mm; the species' historical distribution may have included a more diverse range of habitats	Peak flowering period: October with peak in November	Similar species: Caladenia patersonii?
Caladenia procera Hopper & A.P.Br. (Carbunup king spider orchid)	Critically endangered	WA	Jarrah (*Eucalyptus marginata*), marri (*Corymbia calophylla*) and peppermint (*Agonis flexuosa*) woodland amongst low-dense shrubs	Peak flowering period: mid September to late October	Similar species: *Caladenia pectinata, Caladenia decora* Known to hybridise with forest mantis orchid (*Caladenia attingens*)
Caladenia pumila (dwarf spider-orchid)	Critically endangered	Victoria	Endemic to the Geelong area	Peak flowering period: not specified	Similar species: not specified
Caladenia richardsiorum D.L.Jones (little dip spider-orchid)	Endangered	SA	Range of habitats from exposed limestone cliffs to sheltered coastal mallee vegetation, in closed forests and	Vegetative growth: June to August Flower-bud formation: August Peak flowering period: Late September to early	Similar species: *Caladenia valida, C. hastata, C. reticulata*

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
			low coastal scrub	November	
Caladenia rigida R.S.Rogers (stiff white spider-orchid)	Endangered	SA	In woodland, mostly on ridges and upper slopes, in open places amid sedges	Vegetative growth: June to July Flower-bud formation: early to late August Peak flowering period: late August to October This species seems to depend on appropriate fire regimes to keep its habitat open and is known to flower profusely after fire, but does not require fire to flower	Similar species: *Caladenia intuta* (ghost spider-orchid); *C. behnii* (pink-lipped spider-orchid) may form hybrids with (*C. behrii*) and the veined spider-orchid (*C. reticulata*)
Caladenia robinsonii G.W.Carr (Frankston spider-orchid)	Endangered	Victoria	*Eucalyptus viminalis* ssp. *pryoriana* woodland with a grassy under-storey dominated by *Themeda triandra*	Peak flowering period: mainly in October	Similar species: not specified
Caladenia rosella G.W.Carr (rosella spider-orchid)	Endangered	Victoria	Box and ironbark forests, grassy dry forest and heathy dry forest	Peak flowering period: August and September Flowering may be enhanced by fire	Similar species: crimson spider-orchid (*Caladenia concolor*), elegant spider-orchid (*C. formosa*)
Caladenia saggicola D.L.Jones (sagg	Critically endangered	Tasmania	*Eucalyptus viminalis* woodland with a	Peak flowering period: mid September and mid	Similar species: *Caladenia venusta* (does not occur in

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
spider-orchid)			ground layer dominated by *Lomandra longifolia* on well-drained, grey sandy loams; also *Allocasuarina verticillata* and *Eucalyptus viminalis* woodland on yellow to grey sandy loams over sandstone	October This species responds well to disturbance (rabbits and horses) and is likely to respond strongly to fire	Tasmania), *C. patersonii*
Caladenia sp. Kilsyth South (G.S.Lorimer 1253) Vic. Herbarium (Kilsyth South spider-orchid)	Critically endangered	Victoria	*Eucalyptus radiata–Eucalyptus cephalocarpa* grassy open forest	Peak flowering period: September and October	Similar species: *Caladenia venusta*
Caladenia sylvicola D.L.Jones (forest fingers)	Critically endangered	Tasmania	Heathy *Eucalyptus tenuiramis* forest on a highly isolated hillside and also in open damp *Eucalyptus obliqu*a forest on a moist, south-facing slope, both with well-drained gravelly loam overlying mudstone; elevation range 160 m to 240 m	Peak flowering period: a few days either side of the 1 November	Similar species: not specified

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
Caladenia tensa G.W.Carr (greenscomb spider-orchid)	Endangered	Victoria, SA	Dry open woodland in various habitats including dry cypress-pine (family *Cupressaceae*)/yellow gum woodland, pine/box woodland, mallee-heath sites, heathy woodland and mallee woodland, generally with rock outcrops	Peak flowering period: late August–November	Similar species: *Caladenia tentaculata* and *C. dilatata* Hybrids have been recorded with many members of the *Caladenia patersonii* complex i.e. *C. colorata, C. brumalis, C. woolcockiorum.* Hybrids have been recorded with members of the *C. diltaa* complex including *C. verrucosa* and *C. toxochila*
Caladenia tessellata Fitzg. (thick-lipped spider-orchid)	Vulnerable	NSW, Victoria	Low, dry sclerophyll woodland with a heathy or sometimes grassy under-storey	Vegetative growth: late autumn or early winter Peak flowering period: late September to early November The species' summer dormancy is broken in response to soaking rains in autumn While plants in several populations flower regularly in the absence of fire, for others, especially those growing in dense heath, flowering is much more sporadic and	Similar species: thick-lipped spider-orchid is most similar to the heart-lipped spider-orchid (*Caladenia cardiochila*). Thick-lipped spider-orchid is also similar to the clubbed spider-orchid (*C. clavigera*)

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
				probably relies on periodic fire to remove surrounding vegetation and stimulate flowering	
Caladenia thysanochila G.W.Carr (fringed spider-orchid)	Endangered	Victoria	*Eucalyptus viminalis* ssp. pryoriana woodland	Peak flowering period: October	Similar species: not specified
Caladenia tonellii D.L.Jones (robust fingers)	Critically endangered	Tasmania	*Eucalyptus amygdalina* dominated forest with a shrubby under-storey on shallow clay loam and shallow gravelly loam over clay; topography varies from flats to slopes up to about 80 m elevation	Peak flowering period: late October to early December but most records are from early late November Finished flowers are distinctive due their stature and arrangement The species has one of the longest leaves of *Caladenias* (up to 25 cm long, green and sparsely hairy) and could be used for species identification prior to flowering	Similar species: *Caladenia carnea* Member of the *Caladenia carnea* complex
Caladenia versicolor G.W.Carr (candy spider-orchid)	Vulnerable	Victoria, SA	River red gum flats of seasonally inundated woodland, amidst low sedges	Peak flowering period: September to November	Similar species: *A. colorata*. Member of the *A. patersonii* complex

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
Caladenia viridescens Hopper & A.P.Br. (Dunsborough spider-orchid)	Endangered	WA	Marri (*Corymbia calophylla*), peppermint (*Agonis flexuosa*) woodlands, near coastal heath	Peak flowering period: mid September to late October Dormant between late November and late April	Similar species: *Caladenia paludosa*. Occasionally hybridises with *C. busselliana*
Caladenia wanosa A.S.George (Kalbarri spider-orchid)	Vulnerable	WA	Under shrubs alongside ephemeral streams and among sandstone outcrops	Peak flowering period: mid August to mid September Dormant between late October and late April	Similar species: *Caladenia radialis*
Caladenia williamsiae Hopper & A.P.Br. (Williams spider orchid)	Endangered	WA	In lateritic loamy soils on ridges under open wandoo shrubs	Peak flowering period: early August to September Dormant between late October and late April	Similar species: *Caladenia longiclavata, C. ensata*
Caladenia winfieldii Hopper & A.P.Br. (majestic spider-orchid)	Endangered	WA	In damp areas alongside seasonal streams, growing among low shrubs under scattered *Banskia littoralis*	Peak flowering period: late October to late November	Similar species: *Caladenia harringtoniae, C. startiorum*
Caladenia woolcockiorum D.L.Jones (Woolcock's spider-orchid)	Vulnerable	SA	Grassy, open *Eucalyptus* woodland and forest clearings; on rocky ledges amid *Callitris*	Peak flowering period: August and September Seasonally variable in its flowering	Similar species: *C saxatilis* and the *C. patersonii* complex, especially *C. behrii* and *C. brumalis*. Hybrids have been

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
					recorded with *C. gladiolata*, *C saxatilis* and *C. tensa* in disturbed sites
Caladenia xanthochila D.Beardsell & C.Beardsell (yellow-lip spider-orchid)	Endangered	Victoria, SA	Riparian open forest dominated by *Eucalyptus* species	Peak flowering period: late August to late September	Similar species: *Caladenia stellata, C. rigida*
Caladenia xantholeuca D.L.Jones (white rabbits)	Endangered	SA	Grows in moss pockets on shaded rock ledges under *Callitris glaucophylla*	Peak flowering period: September and October	Similar species: *C. carnea*, *C. coactilis*. This is an outcrossing species
Calochilus psednus D.L.Jones & Lavarack (Cardwell beard orchid)	Endangered	Queensland	Occurs in *Melaleuca* woodland with an under-storey of dense sedges and scattered low shrubs. Soils are seasonally inundated sandy loams	Peak flowering period: December to February	Similar species: *C. caeruleus*
Calochilus richiae Nicholls (bald-tip beard-orchid)	Endangered	Victoria	Dry heathy woodland under-storey of low shrubs	Peak flowering period: mid to late October	Similar species: not specified
Corunastylis brachystachya (Lindl.) D.L.Jones & M.A.Clem. (short-spiked midge-	Endangered	Tasmania	Heathland and heathy eucalypt woodland, near-coastal rocky areas	Peak flowering period: February to April	Similar species: not specified

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
orchid)					
Corunastylis ectopa (D.L.Jones) D.L.Jones & M.A.Clem. (Brindabella midge-orchid)	Critically endangered	ACT	Tall *Eucalyptus radiata* forest	Peak flowering period: late January to mid March The buds develop rapidly and flowering is in progress about six weeks after the initialising rain event. In the absence of rain at the appropriate season the plants remain dormant	Similar species: not specified
Corunastylis firthii (Cady) D.L.Jones & M.A.Clem. (Firth's midge-orchid)	Critically endangered	Tasmania	Low coastal scrub and tall open banksia shrubland with a heathy and sedgy under-storey	Peak flowering period: December to March	Similar species: not specified
Corunastylis littoralis (D.L.Jones) D.L.Jones & M.A.Clem. (Tuncurry midge orchid)	Critically endangered	NSW	Low dense heath, in sparse shrubland and Daphne heath (*Brachyloma daphnoides*), and in teatree (*Leptospermum* spp.) thickets woodland	Peak flowering period: between February and April	Similar species: not specified
Corybas dentatus D.L.Jones (Finniss helmet-orchid)	Vulnerable	SA	Woodland in damp sandy soil, under bracken in woodland and native pines or in	Peak flowering period: July to August	Similar species : *C. incurvus*

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
			shaded gorges		
Corybas montanus D.L.Jones (small helmet-orchid)	Vulnerable	Queensland, NSW	Mountain tops in open forest	Peak flowering period: June to July	Similar species: not specified
Corybas sulcatus (grooved helmet-orchid)	Critically endangered	Tasmania	Endemic to Macquarie Island Grows on wet grassy seepage areas	Peak flowering period: late spring through to early summer	Similar species: not specified
Crepidium lawleri (Lavarack & B.Gray) Szlach.	Endangered	Queensland	Margin of a *Pandanus* swamp in a shady moist situation	Peak flowering period: September	Similar species: not specified
Cryptostylis hunteriana Nicholls (leafless tongue-orchid)	Vulnerable	Victoria, NSW and Queensland	Wide variety of habitats including coastal districts, heathlands, heathy woodlands, sedgelands, forests, and Spear Grass-tree (*Xanthorrheoa resinosa*) plains	Peak flowering period: Victoria/NSW: December to February Queensland: August Australia: August to February NSW: December to January	Similar species: large tongue-orchid (*Cryptostylis subulata*) and the small tongue-orchid (*Cryptostylis leptochila*)
Dendrobium antennatum Lindl.	Endangered	Queensland	Riverine areas in lowland gorges, growing on rainforest trees	Peak flowering period: erratic but usually March to November or possibly throughout the year, with	Similar species: not specified

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
				an emphasis on winter	
Dendrobium bigibbum Lindl.	Vulnerable	Queensland	Epiphyte, lithophyte; branches of small trees, or on rocks, in open monsoon forests, often occurring along creeks or on rocky hillsides where fire cannot penetrate	Peak flowering period: may occur between January and October, with an emphasis on March to August and the flowers last about a month	Similar species: not specified
Dendrobium brachypus (Endl.) Rchb.f. (Norfolk Island orchid)	Endangered	Norfolk Island	Occurs on tree branches in forests on mountain slopes	Peak flowering period: not specified	Similar species: not specified
Dendrobium callitrophilum B.Gray & D.L.Jones (thin feather orchid)	Vulnerable	Queensland, Norfolk Island	Epiphyte in rain forest and rainforest margins	Peak flowering period: August and September Flowers lasts about a week, changing colour from greenish-yellow to apricot as they age	Similar species: *D. aemulum*
Dendrobium carronii Lavarack & P.J.Cribb	Vulnerable	Queensland	Epiphyte on paper-barked species of *Melaleuca* in mixed open forests, but also on *Xanthostemon crenulatus* and *Lophostemon suaveolens* in swamp	Peak flowering period: late winter or early spring	Similar species: closely related to *D. canaliculatum* R.Br. and the two species are difficult to separate when not in flower

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
			forests		
Dendrobium johannis Bateman ex Rchb.f	Vulnerable	Queensland	Epiphyte in moist, open forests, mixed open forests and semi-deciduous notophyll vine forests and swamp forests	Peak flowering period: March to May	Similar species: not specified
Dendrobium lithocola (D.L.Jones & M.A.Clem.) M.A.Clem. & D.L.Jones	Endangered	Queensland	Lithophytic, growing in rainforest	Peak flowering period: autumn and the flowers last for about a month	Similar species: not specified
Dendrobium mirbelianum Gaudich	Endangered	Queensland	Epiphytic in coastal swamps and mangroves; may grow on boulders	Peak flowering period: variable and sporadic in this species, but generally occurs from August to November	Similar species : *Dendrobium discolor*
Dendrobium nindii W.Hill	Endangered	Queensland	Mostly epiphytic in coastal swamps where it grows on a range of trees including palms and mangroves	Peak flowering period: July to October	Similar species: not specified
Dendrobium phalaenopsis (Fitzg.) M.A.Clem. & D.L.Jones	Vulnerable	Queensland	Epiphyte; open forests and dry scrubs often near beaches, in areas with a hot	Peak flowering period: autumn and the flowers last about a month Occasional white flowered	Similar species: not specified

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
(Cooktown orchid)			climate and extremely seasonal rainfall	plants have been found	
Dendrobium x *superbiens* Rchb.f. (curly pinks)	Vulnerable	Queensland	Stunted coastal scrubs on low trees or on rocks, often in exposed conditions occurring along creeks or on rocky hillsides where fire cannot penetrate	Peak flowering period: February to June	Similar species: not specified
Diplocaulobium masonii (Rupp) Dockrill syn. *Dendrobium stelliferum*	Extinct	Queensland	On trees on the edge of mangrove swamps in conditions of high humidity and relatively strong light	Peak flowering period: not specified	Similar species: not specified
Dipodium pictum (Lindl.) Rchb.f.	Endangered	Queensland	Grows in or near rainforest, climbing up trees	Peak flowering period: July and December	Similar species: not specified
Diuris aequalis F.Muell. ex Fitzg. (buttercup doubletail)	Vulnerable	NSW	Montane and tableland eucalypt forest with a grassy-heathy under-storey	Peak flowering period: October to December	Similar species: *Diuris maculata*
Diuris basaltica D.L.Jones (small golden moths orchid) (syn. *Diuris* sp. aff. *lanceolata*	Endangered	Victoria	*Themeda triandra* grassland	Peak flowering period: September to October Stimulated by regular fire or light grazing	Similar species: not specified

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
(Laverton))					
Diuris bracteata Fitzg.	Extinct	NSW	Dry sclerophyll woodland	Peak flowering period: September	Similar species: not specified
Diuris drummondii Lindl. (tall donkey orchid)	Vulnerable	WA	Low-lying depressions in peaty and sandy, clay swamps	Peak flowering period: late October to mid January. Note: flowers earlier in the north and later in the south Dormant between late January and late April Summer fires stimulate flowering in most populations	Similar species: has often confused with *Diuris emarginata* and *D. heberle*
Diuris fragrantissima D.L.Jones & M.A.Clem. (sunshine diuris)	Endangered	Victoria	*Themeda triandra* dominated grasslands	Vegetative growth: autumn, usually after the beginning of seasonal rains. Peak flowering period: mid-October to early November, and is over by early December. Hot summer fires are likely to enhance flowering in the following flowering season	Similar species: Wedge Diuris (*Diuris dendrobioides*)
Diuris lanceolata	Endangered	Tasmania,	Coastal scrub and	Peak flowering period:	Similar species: *Diuris*

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
Lindl. (snake orchid)		NSW and Queensland	windswept coastal grassland and heathland among dwarfed shrubs and sedges on moist to well-drained sandy and clay loam, sometimes on rocky outcrops	November to January predominantly in November	*chryseopsis* and *D. behrii*
Diuris micrantha D.L.Jones (dwarf bee-orchid)	Vulnerable	WA	Winter-wet depressions or swamps	Peak flowering period: August to early October Dormant between November and late April	Similar species: Bee orchid (*Diuris laxiflora*)
Diuris ochroma D.L.Jones (pale golden moths)	Vulnerable	NSW, Victoria	Montane riparian grassland; wet open grassland	Peak flowering period: November and December	Similar species: not specified
Diuris pedunculata (small snake orchid)	Endangered	NSW, Victoria	Open areas of dry scherophyll forests with grassy understories, in riparian forest, swamp forests, subalpine grassland and herbfields	Peak flowering period: August to October	Similar species: *Diuris longifolia* and *D. subalpina*
Diuris praecox D.L.Jones (Newcastle	Vulnerable	NSW	Near-coastal districts open heathy forests	Vegetative growth: winter Peak flowering period: late July to early	Similar species: Lemon doubletail (*D. abbreviata)*

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
doubletail)				September	
Diuris purdiei Diels (Purdie's donkey-orchid)	Endangered	WA	Grows among native sedges in areas subject to winter inundation	Peak flowering period: late September to mid October Dormant between late November and late April Flowers only after a summer fire	Similar species: *Diuris laevis*
Diuris venosa Rupp (veined doubletail)	Vulnerable	NSW	Semi-swampy area and low-lying sites, swamp margins in tall open forest	Peak flowering period: November to January	Similar species: not specified
Drakaea concolor Hopper & A.P.Br. (kneeling hammer-orchid)	Vulnerable	WA	Sandy soils in open areas among heath and sedges	Peak flowering period: mid August to September Dormant between November and late April	Similar species: glossy-leaved hammer orchid (*Drakaea elastica*)
Drakaea confluens Hopper & A.P.Br. (late hammer-orchid)	Endangered	WA	Open areas in mixed jarrah- banksia woodland	Peak flowering period: late October to November Dormant between December and late April	Similar species: *Drakaea isolata* and *D. livida*
Drakaea elastica Lindl. (glossy-leaved hammer-orchid)	Endangered	WA	In sandy soil adjacent to winter-wet depressions, swamps and water courses, growing in mixed	Peak flowering period: late September to early November Dormant between	Similar species: Kneeling hammer orchid (*Drakaea concolor*

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
			woodlands, often under *Kunzea* species	December and late April *Drakaea elastica* likes open sites and is often found on old, disused tracks and firebreaks	
Drakaea isolata Hopper & A.P.Br. (lonely hammer-orchid)	Endangered	WA	Grows with the broad-billed duck orchid (*Paracalaena triens*) among low shrubs and mallee eucalypts on a rise above a salt lake	Peak flowering period: September to early October Dormant between late November and late April	Similar species: late hammer orchid (*Drakaea confluens*)
Drakaea micrantha Hopper & A.P.Br. (dwarf hammer-orchid)	Vulnerable	WA	Jarrah (*Eucalyptus marginata*) and common sheoak (*Allocasuarina fraseriana*) woodland or forest associated with *Banksia* species	Peak flowering period: early September to October Dormant between late November and late April	Similar species: King-in-his-carriage (*Drakaea glyptodon*)
Epiblema grandiflorum N.Hoffman & A.P.Br. [nom. inval.] (baby blue orchid)	Endangered	WA	Among dense sedges and *Astartea fascicularis* under tall paperbarks (*Melaleuca preissiana* and *M. rhaphiophylla*) in a winter-wet swamp often with its base in water	Peak flowering period: late November the species appears to require a water depth of 10–20 cm during spring to initiate flowering, followed by a drying out during summer	Similar species: not specified

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
Genoplesium plumosum (Rupp) D.L.Jones & M.A.Clem. (plumed midge-orchid)	Endangered	NSW	Low-heath heathland, with associated moss/lichen beds over sandstone rock sheets	Peak flowering period: late February to March	Similar species: *G. sagittiferum*
Eria paleata Rchb.f. ex Kraenzl. *Genoplesium rhyoliticum* D.L.Jones & M.A.Clem. (Pambula midge-orchid)	Endangered Endangered	Norfolk Island NSW	Epiphyte on tree branches Rhyolite outcrops with low open heath and skeletal soils	Peak flowering period: not specified Vegetative growth: late spring to early summer and is stimulated by rain. Peak flowering period: December to late January	Similar species: not specified Similar species: *G. morrisii*
Genoplesium tectum D.L.Jones (cardwell midge orchid)	Endangered	Queensland	Dense sedges and low shrubs in woodland near creeks	Peak flowering period: November to March	Similar species: No
Genoplesium vernale D.L.Jones (East Lynne midge-orchid)	Vulnerable	NSW	Low, open eucalypt forest	Peak flowering period: November to December	Similar species: *Genoplesium woollsii*
Grastidium tozerense (Lavarack) M.A.Clem. & D.L.Jones	Vulnerable	Queensland	On scattered small trees growing on open rocky areas with occur in the midst of the rainforest; occasionally growing	Peak flowering period: the flowering time appears to be during the summer in cultivation, but plants were collected in flower in September and it is	Similar species: *D. baileyi*

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
			on rocks	possible if flowers spasmodically throughout the year	
Habenaria macraithii Lavarack	Endangered	Queensland	Tall gallery forest with an open under-storey; evergreen notophyll vine forest	Peak flowering period: late autumn and winter	Similar species: *Habenaria dryadum* and *H. dracaenifolia* (PNG species) *H. hymenophylla* (NT species)
Microtis angusii D.L.Jones (Angus's onion orchid)	Endangered	NSW	Among grass in low woodland	Peak flowering period: May to October Flower prolifically after fire	Similar species: *Microtis parviflora* and *Microtis unifolia*
Microtis globula R.J.Bates (south-coast mignonette orchid)	Vulnerable	WA	In seasonally swampy areas which burnt the previous summer, growing, in peaty soils and damp sand	Peak flowering period: mid December to mid January, only after hot summer fires Dormant between February and late April	Similar species: none
Nematoceras dienemum (D.L.Jones) D.L.Jones, M.A.Clem. & Molloy (windswept helmet-orchid)	Critically endangered	Macquarie Island (Tasmania)	Lower coastal terraces (less than 30 m above sea level) and peat wetlands	Peak flowering period: November to January	Similar species: not specified
Oberonia attenuata Dockrill	Extinct	Queensland	*Oberonia attenuata* grew on trees in	Peak flowering period: May and September	Similar species: other Australian *Oberonia*

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
			lowland rainforests, particularly those in gorges or near watercourses		species
Paracaleana dixonii Hopper & A.P.Br. (sandplain duck orchid)	Endangered	WA	Open sandy areas in heathland	Peak flowering period: late October to late November Dormant between December and late April.	Similar species: *Paracaleana graniticola, P. brockmanii*
Phaius australis F.Muell. (lesser swamp-orchid)	Endangered	Queensland, NSW	Coastal wet heath/sedgeland wetlands, swampy grassland or swampy forest; swamp-forest margins	Peak flowering period: September to November	Similar species: greater swamp-orchid *(Phaius tancarvilleae*)
Phaius bernaysii Rowland ex. Rchb.f	Endangered	Queensland	Protected swampy areas	Peak flowering period: September to November	Similar species: *Phaius australis*
Phaius pictus T.E.Hunt	Vulnerable	Queensland	Rainforest close to streams or in localised patches of seepage	Peak flowering period: April to June	Similar species: not specified
Phalaenopsis amabilis subsp. *rosenstromii* (F.M.Bailey) (native moth orchid)	Endangered	Queensland	Epiphyte; humid rainforest areas, close to waterfalls or streams, in deep gorges, sheltered slopes or gullies in	Peak flowering period: December to April	Similar species: not specified

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
			notophyll vine thickets, deciduous vine thickets and in open forest		
Plexaure limenophylax Endl. (Endl.) Benth. (Norfolk Island phreatia)	Critically endangered	Norfolk Island	Epiphyte on tree branches	Peak flowering period: not specified	Similar species: *Phreatia paleata*
Pomatocalpa marsupiale (Kraenzl.) J.J.Sm.	Vulnerable	Queensland	Grows high up on trees and on exposed rocks in rainforest	Peak flowering period: not specified	Similar species: not specified
Prasophyllum affine Lindl. (Jervis Bay leek orchid)	Endangered	NSW	Low, grassy heathland and sedgeland communities, often in a mosaic with clumps of a mallee form of red bloodwood (*Corymbia gummifera*)	Peak flowering period: early to mid-November	Similar species: maroon leek-orchid (*Prasophyllum frenchii*) and *P. litorale.* (*P. litorale* only occurs in Victoria and SA)
Prasophyllum amoenum D.L.Jones (dainty leek orchid)	Endangered	Tasmania	Buttongrass moorland habitat on damp stony loam; alpine sedgeland, sedgey heathland and bolster heathland	Peak flowering period: late December to early March (depending on altitude). Species may respond favourably to disturbance but not necessarily fire	Similar species: not specified

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
Prasophyllum apoxychilum D.L.Jones (tapered leek-orchid)	Endangered	Tasmania	Coastal heathland or grassy and scrubby open eucalypt forest on sandy and clay loams, often among rocks; occurs at a range of elevations and seems to be strongly associated with dolerite in the east/south-east of its range	Peak flowering period: October to December Flowering is stimulated by fire and slashing	Similar species: part of the *P. truncatum* complex
Prasophyllum atratum D.L. Jones & D.T. Rouse (three hummock leek-orchid)	Critically endangered	Tasmania	Sedgey heathland on grey sandy loam beside an airstrip; single known population	Peak flowering period: October to November with peak in first two weeks of November The species may require disturbance to stimulate emergence and flowering and is currently only found in areas that are slashed or burned regularly	Similar species: not specified
Prasophyllum bagoense (Bago leek-orchid)	Critically endangered	NSW	Subalpine treeless plain at an elevation of approximately 1200 m that comprises at least four plant communities: Fen I;	Peak flowering period: December to January and fruits from December to March (season dependent)	Similar species: not specified

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
			Aquatic sedgeland—alpine bog community; tall wet heathland and McPhersons Plains open heathland; adjacent eucalypt woodland	Flowering may be stimulated by fire	
Prasophyllum castaneum D.L.Jones (chestnut leek-orchid)	Critically endangered	Tasmania	Coastal areas in damp shrubby and sedgey heath on sandy loam or skeletal rocky soils; subject to exposure by strong sea winds	Peak flowering period: late November to January with peak in December Flowering is probably stimulated by fire and likes disturbance	Similar species: *P. frenchii* (can be confused with *P. concinnum*)
Prasophyllum colemaniae R.S.Rogers (lilac leek-orchid)	Vulnerable	Victoria	Grassy woodlands	Peak flowering period: October to November	Similar species: *P. spicatum* and *P. truncatum*
Prasophyllum correctum D.L.Jones (gaping leek-orchid)	Endangered	Victoria	Central Gippsland Plains kangaroo grass (*Themeda triandra*) grassland and forest red gum (*Eucalyptus tereticornis*) grassy woodland	Vegetative growth: mid April and mid June Flower buds develop: mid October Peak flowering period: third week of October, when the first flowers open from the centre of	Similar species: tawny leek-orchid (*Prasophyllum fuscum*)

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
				the spike, followed by flowers at the base of the spike and then those at its apex. Flowering is complete by early November There is a high degree of annual variability in flowering and emergence of *P. correctum*	
Prasophyllum crebriflorum D.L.Jones (crowded leek-orchid)	Endangered	Tasmania	Montane tussock grassland dominated by *Poa labillardierei*, with scattered patches of the woody shrub *Hakea microcarpa;* native grassland dominated by *Poa gunnii* and grassy woodland with a sparse overstorey of *Eucalyptus gunnii*	Peak flowering period: early December to mid January	Similar species: golfers leek-orchid (*Prasophyllum incorrectum*)
Prasophyllum diversiflorum Nicholls (Gorae leek-orchid)	Endangered	Victoria	Open forest along watercourses and around swamp margins which are in seasonally inundated	Peak flowering period: December to February	Similar species: *Prasophyllum* sp. aff. *frenchii* 1, also known as *P*. sp. Aff. *frenchii* A
Prasophyllum favonium D.L.Jones	Critically endangered	Tasmania	Windswept, dense, low heathland on	Peak flowering period: October and November	Similar species: not

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
(western leek-orchid)			moderately drained dark grey to black sandy peaty loams	with peak in November	specified
Prasophyllum frenchii F.Muell. (maroon leek-orchid)	Endangered	Victoria, NSW, south-east SA	Open sedge swampland or in wet grassland and wet heathland generally bordering swampy regions	Peak flowering period: October to December	Similar species: *Prasophyllum litorale* R.J. Bates (coastal leek-orchid), *P. niphopedium* D.L. Jones (alpine marsh leek-orchid), *P. rogersii* Rupp (marsh leek-orchid), *P. canaliculatum* D. L. Jones (channelled leek-orchid), *P. appendiculatum* Nicholls (tailed leek-orchid), *P. murfetii* D. L. Jones (Murfets leek-orchid) and *P. fosteri* D.L. Jones (Shelford leek-orchid)
Prasophyllum fuscum R.Br. (tawny leek-orchid)	Vulnerable	NSW	Wet, low heathland on gentle slopes or in moist heath, often along seepage lines	Peak flowering period: October to December	Similar species: *Prasophyllum pallens* and *P. uroglossum*
Prasophyllum goldsackii J.Z.Weber & R.J.Bates (Goldsack's leek-orchid)	Endangered	SA	Limestone ridges in mallee woodlands or in open scrublands	Peak flowering period: late September to October. Only flowers occasionally and the flowers rarely open	Similar species: *Prasophyllum* sp. Enigma (R.Bates 2350)

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
Prasophyllum incorrectum D.L.Jones (golfers leek orchid)	Critically endangered	Tasmania	Damp native grassland and grassy eucalypt and banksia woodland on sandy loam	Peak flowering period: October and November (with peak around late October; very short flowering period Likes disturbance, specifically slashing and would most likely respond strongly to grassland fires	Similar species: crowded leek-orchid (*P. crebriflorum*)
Prasophyllum limnetes D.L.Jones (marsh leek-orchid)	Critically endangered	Tasmania	Ecotone between low-lying marshy heath/sedgeland dominated by rushes and sedges with scattered patches of *Lomandra longifolia* and *Themeda triandra*, and coastal *Eucalyptus amygdalina* woodland with a heathy/grassy under-storey; single known population	Peak flowering period: late November to December being in full flower mid December Responds strongly to fire disturbance	Similar species: not specified
Prasophyllum milfordense D.L.Jones (Milford leek-orchid)	Critically endangered	Tasmania	*Eucalyptus viminalis* woodland with sagg-dominated ground layer on well-drained, grey sandy loams; single known	Peak flowering period: late October to early December with a peak in November	Similar species: part of the *P. truncatum* complex

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
			population Restricted distribution in southern Tasmania		
Prasophyllum morganii Nicholls (mignonette leek-orchid)	Vulnerable	Victoria	Open forest of *Eucalyptus pauciflora* ssp. *pauciflora* and *Eucalyptus rubida*	Peak flowering period: October and November	Similar species: *Prasophyllum retroflexum*
Prasophyllum murfetii D.L.Jones (Fleurieu leek orchid)	Critically endangered	SA	Swampy sites in low-lying areas around the margins of permanent swamps or lakes	Peak flowering period: November to January	Similar species: *Prasophyllum frenchii*
Prasophyllum olidum D.L.Jones (pungent leek-orchid)	Critically endangered	Tasmania	Damp *Themeda* grassland on sandy loam; single known population	Peak flowering period: late November and December Very short flowering period	Similar species: *P. rostratum*; *P. diversiflorum* (note: *P. diversiflorum* is a Victorian species)
Prasophyllum pallidum Nicholls (pale leek-orchid)	Vulnerable	SA	South Australian blue gum (*Eucalyptus leucoxylon*) open forest, low open-forest and low woodland; long-leaved box (*Eucalyptus goniocalyx*) woodland; pink gum	Peak flowering period: late September to early November Regeneration is thought to be stimulated by fire	Similar species: *Prasophyllum fitzgeraldii*

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
			(*Eucalyptus fasciculosa*) low woodland and low open-woodland; grey box (*Eucalyptus microcarpa*) woodland; slender cypress pine (*Callitris gracilis*) pink gum low open-forest		
Prasophyllum perangustum D.L.Jones (Knocklofty leek-orchid)	Critically endangered	Tasmania	Grassy *Eucalyptus pulchella* forest on well-drained clay loam and skeletal clay loam derived from dolerite; single known population in the foothills of Mt Wellington at an altitude of about 350 m	Peak flowering period: November and December	Similar species: *P. rogersii* (note: this is a NSW species)
Prasophyllum petilum D.L.Jones & R.J.Bates (Tarengo leek orchid)	Endangered	ACT, NSW	Grassy woodland or natural grassland	Peak flowering period: late October and early November in the Ilford/Boorowa/Hall areas, and in early December in the Delegate/Captains Flat areas Associated with damp depressions which pool	Similar species: Prasophyllum campestre

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
				water after rain	
Prasophyllum pruinosum R.S.Rogers (plum leek-orchid)	Endangered	SA	Open woodland habitats; usually with an overstorey of pink gum (*Eucalyptus fasciculosa*), South Australian blue gum (*E. leucoxylon*), and *Callitris gracilis*	Peak flowering period: late September to November	Similar species: *P. patens* complex
Prasophyllum pulchellum D.L.Jones (pretty leek-orchid)	Critically endangered	Tasmania	Dense, low sedgy heath with pockets of paperbark or tea-tree on poorly to moderately-drained sandy or peaty loam; widely scattered coastal and near-coastal sites in the north, north-west and south-east	Peak flowering period: late October to December Flowering is stimulated by fire	Similar species: not specified
Prasophyllum robustum (Nicholls) M.A.Clem. & D.L.Jones (robust leek-orchid)	Critically endangered	Tasmania	Grassy and shrubby *Eucalyptus amygdalina* forest on well-drained brown loam derived from basalt	Peak flowering period: early November	Similar species: *P. stellatum*
Prasophyllum secutum D.L.Jones	Endangered	Tasmania	Dense coastal scrub in the swales of	Peak flowering period: October to December	Similar species: *Prasophyllum secutum* is

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
(northern leek-orchid)			stabilised sand dunes on white to grey sands and sandy loam; the species has only ever been detected in the first few flowering seasons after high-intensity summer fires	Emergence and flowering is highly dependent on a hot summer fire the preceding season. In the absence of fire chances of seeing plants is extremely low	most similar to *P. favonium*
Prasophyllum sp. Wybong (C.Phelps ORG 5269) Australian National Herbarium	Critically endangered	NSW	Open eucalypt woodland and grassland	Vegetative growth: over winter and spring. Peak flowering period: spring	Similar species: not specified
Prasophyllum spicatum R.J.Bates & D.L.Jones (dense leek-orchid)	Vulnerable	Victoria, SA	Grassland, heathland and heathy woodland	Peak flowering period: September to November Flowering is enhanced by disturbance such as burning or slashing of the habitat, during the previous summer	Similar species: *P. odoratum* and *P. patens* (*P. patens* is a NSW species)
Prasophyllum stellatum D.L.Jones (Ben Lomond leek-orchid)	Critically endangered	Tasmania	*Eucalyptus delegatensis* forest (with *Eucalyptus dalrympleana* as a minor canopy component), with a shrubby to grassy under-storey; most	Peak flowering period: January to March with peak flowering of the species occurring mid to late February	Similar species: *P. truncatum* complex most similar to *P. robustum*

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
			sites have a relatively high surface rock cover with deep clay-loam soils; elevation range 555 m to 960 m		
Prasophyllum suaveolens D.L.Jones & R.J.Bates (fragrant leek-orchid)	Endangered	Victoria	Grassland and open grassy woodland	Peak flowering period: October and November	Similar species: *P. fuscum*, *P. correctum* and *P. rostratum* (note: *P. fuscum* is a NSW species, *P. rostratum* is a Tasmanian species)
Prasophyllum subbisectum Nicholls (Pomonal leek-orchid)	Endangered	Victoria	Heathy woodlands and heathy open forests dominated by *Eucalyptus leucoxylon* sens. lat. and *Eucalyptus goniocalyx*	Peak flowering period: October and November	Similar species: not specified
Prasophyllum taphanyx D.L.Jones (graveside leek-orchid)	Critically endangered	Tasmania	Native grassland on well-drained basaltic soils; single known population	Peak flowering period: late October and early November	Similar species: not specified
Prasophyllum tunbridgense D.L.Jones (Tunbridge leek-orchid)	Endangered	Tasmania	Native grassland on well-drained loams derived from basalt	Peak flowering period: October to November Very brief flowering period	Similar species: *Prasophyllum milfordense* and *P. truncatum*

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
Prasophyllum validum R.S.Rogers (sturdy leek-orchid)	Vulnerable	SA	*Eucalyptus microcarpa* woodland and low woodland; *Eucalyptus leucoxylon* woodland and open-forest; *Eucalyptus cladocalyx* association	Peak flowering period: October and November	Similar species: not specified
Prasophyllum wallum R.J.Bates & D.L.Jones (wallum leek-orchid)	Vulnerable	Queensland	Wallum communities and on stabilised dunes	Peak flowering period: August and September	Similar species: not specified
Pterostylis arenicola M.A.Clem. & J.Stewart (sandhill greenhood orchid)	Vulnerable	SA	Mallee box (*Eucalyptus porosa*) and drooping sheoak (*Allocasuarina verticilla*); golden wattle (*Acacia pycnantha*) +/- drooping sheoak; mallee pine (*Callitris gracilis*) +/- drooping sheoak; soap mallee (*Eucalyptus deiversifolia*) +/- golden wattle +/- drooping sheoak on sand-hills in near coastal areas	Vegetative growth: June Flower-bud formation: July to August Peak flowering period: September to December Highly variable species with no two plants looking the same in flower morphology and colouring	Similar species: rufa greenhood (or baggy britches) *Pterostylis boormanii*

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
Pterostylis atriola D.L.Jones (snug greenhood)	Endangered	Tasmania	Dry to damp sclerophyll forest on generally stony soils, typically with an open under-storey; the species occurs at a range of elevations but is most strongly associated with 'winter-cold' sites (e.g. Snug Tiers) or areas receiving a moderately consistent rainfall (e.g. Wielangta, Railton)	Peak flowering period: January to March, peaking in February, may flower as late as May at some sites Some level of disturbance is thought to be required for persistence	Similar species: leafless greenhood (*Pterostylis aphylla;* baby greenhood (*Pterostylis parviflora*); marsh greenhood (*Pterostylis uliginosa*)
Pterostylis basaltica D.L.Jones & M.A.Clem. (basalt greenhood)	Endangered	Victoria	Grows among rocks on basalt outcrops, which are scattered in grassland and sparse woodland	Peak flowering period: November to January Even at flowering time the orchids can be difficult to sight	Similar species: not specified
Pterostylis bicornis D.L.Jones & M.A.Clem.	Vulnerable	Queensland	Growing in small humus pockets on bare rock	Peak flowering period: June and July	Similar species: not specified
Pterostylis bryophila D.L.Jones (Hindmarsh Valley greenhood)	Critically endangered	SA	South Australian blue gum (*Eucalyptus leucoxylon*) and pink gum (*E. fasciculosa*) open forest or	Vegetative growth: March to April Flower-bud formation: April to May	Similar species: coastal greenhood (*Pterostylis alveata*) and *P. obtusa*. (Note: *P. obtusa* does not

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
			woodland; grassy woodland in mossy gullies along drainage lines; on steep slopes and ridges near creeks	Peak flowering period: May to July Flowering abundance is known to vary significantly from year to year depending on autumn rainfall	occur in SA)
Pterostylis cheraphila D.L.Jones & M.A.Clem. (floodplain rustyhood)	Vulnerable	Victoria	Floodplain in riverine woodland dominated by *Eucalyptus largiflorens*	Peak flowering period: October and November	Similar species: not specified
Pterostylis chlorogramma D.L.Jones & M.A.Clem. (green-striped greenhood)	Vulnerable	Victoria, SA	Moist open forest among herbs and shrubs	Peak flowering period: July to September	Similar species: not specified
Pterostylis cobarensis M.A.Clem. (Cobar greenhood orchid)	Vulnerable	NSW, Qld, SA	Grows among rocks on low hills, on slopes above streams, on rocky hills, sheltered locations between rocks and under trees	Peak flowering period: September to November	Similar species: not specified
Pterostylis commutata D.L.Jones (midland	Critically endangered	Tasmania	Native grassland and *Eucalyptus pauciflora* grassy woodland on well-drained sandy	Flowering occurs from December to January usually in full flower	Similar species: *P. biseta* (mainland species)

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
greenhood)			soils and basalt loams; occurs in small, loose colonies	around Christmas time The rosette is present at flowering although usually withering	
Pterostylis cucullata subsp. *cucullata* D.L.Jones (leafy greenhood)	Listed at species level	SA, Victoria and Tasmania	Calcareous dunes and sand-sheets in near-coastal areas, within closed scrubs dominated by either *Leptospermum laevigatum* or *Beyeria lechenaultii* var. *latifolia*; sites are typically sheltered, facing south or south-easterly to westerly, with seasonally damp but well-drained humus-rich sandy loams, often with moss and deep leaf litter	Flower-bud formation: August Peak flowering period: mid October to mid November Although this species can form massive colonies it can be difficult to detect because plants can occur among dense grass and beneath low coastal scrub Has distinctive rosettes that can be easily counted	Similar species: not specified
Pterostylis despectans (Nicholls) M.A.Clem. & D.L.Jones (lowly greenhood)	Endangered	SA, Victoria and NSW	Peppermint box *(Eucalyptus odorata*) grassy woodland; flat or undulating woodland or open forest of yellow gum	Vegetative growth: rosettes develop in winter to early spring but generally wither before the flower spike matures. Peak flowering period:	Similar species: *Pterostylis mirabilis*, *O. bisetus* complex

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
			(*Eucalyptus leucoxylon*) and grey box (*E. microcarpa*) or yellow gum and yellow box (*E. melliodora*); adjacent to red gum (*E. camaldulensis*) woodland; adjacent to red box (*E. polyanthemos*) open forests	late October into summer, but mostly in November and December The species is usually found in open areas where it is well camouflaged by grass and leaf litter, and may sometimes be hidden away under low shrubs; forms quite extensive colonies; flowers open up to a month after the leaves have withered away	
Pterostylis gibbosa R.Br. (Illawarra greenhood)	Endangered	NSW, Qld	Flat, gently sloping sites on the coastal plain; woodlands with a native grass under-storey	Peak flowering period: late August to early September and can last until early December under favourable conditions It has been noted that orchids that have withered due to dry conditions early in the growing season may resprout in response to good rains later in the season	Similar species: not specified
Pterostylis oreophila	Critically endangered	NSW, ACT,	Small montane and	Peak flowering period	Similar species: not

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
Clemesha (Kiandra greenhood)		Victoria	subalpine streams under tall dense thickets of *Leptospermum grandiflorum* (mountain tea tree), and sphagnum mounds	November to January Pod development to ripening occurs from December to March	specified
Pterostylis pratensis D.L.Jones (Liawenee greenhood)	Vulnerable	Tasmania	Subalpine *Poa labillardierei* tussock grassland with patches of often stunted *Olearia algida* and *Hakea microcarpa* scrub on red–brown loamy to clay soils derived from basalt; grows in very exposed conditions at altitude of 850 m to 1100 m above sea level	Peak flowering period: mid-November to mid-December	Similar species: the *P. mutica* complex (*P. mutica, P. rubenachii, P. wapstratum*) and *P. cycnocephala* complex (*P. pratensis, P. ziegeleri*)
Pterostylis pulchella Messmer (pretty greenhood)	Vulnerable	NSW	Escarpments close to waterfalls, on moist, sheltered ridges, and creek banks	Peak flowering period: February to May	Similar species: *P. grandiflora, P. ophioglossa, P. reflexa* and *P. obtusa*
Pterostylis rubenachii D.L.Jones (Arthur	Endangered	Tasmania	Dry sandy slopes of sparsely vegetated stabilised sand	Flowering period: October to November with the peak in early November	Similar species: not specified

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
River greenhood)			dunes, and also in permanently wet to moist scrubby and sedgey coastal heath converted to semi-improved pasture by regular slashing		
Pterostylis saxicola D.L.Jones & M.A.Clem. (Sydney Plains greenhood)	Endangered	NSW	Heathy forests, in shallow sandy soil over flat sheets of sandstone and also in crevices between sandstone boulders, often in close proximity to streams	Peak flowering period: October to December	Similar species: *P. gibbosa, P. chaetophora*
Pterostylis sp. Botany Bay (A.Bishop J221/1-13) NSW Herbarium (Botany Bay bearded greenhood orchid)	Endangered	NSW	Grows in low coastal heathland, in moist level sites	Flower bud production: July Peak flowering period: August to September	Similar species: *Pterostylis plumosa*, *P.* sp. aff. *plumosa* (Mallee) and *P.* sp. aff. *plumosa* (Anglesea), *P. tasmanica.* Both *P.* sp. aff. *plumosa* (Mallee) and *P.* sp. aff. *plumosa* (Anglesea) are Victorian species
Pterostylis sp. Eyre Peninsula R.J.Bates syn. *P. mirabilis* (nodding rufoushood)	Vulnerable	SA	Scrublands of broombush (*Melaleuca uncinata*); woodland of *Callitris* and *Eucalypt* spp.	Vegetative growth: May to June Flower-bud formation: September	Similar species: late flowering lowly greenhood (*Pterostylis despectans*

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
				Peak flowering period: October to December	
Pterostylis sp. Flat Rock Creek (D.L.Jones 15873 & K.J.Fitzgerald). Now named as *P. vernalis* Australian National Herbarium (spring tiny greenhood)	Critically endangered	NSW	Heath and heathy forests, beneath taller shrubs	Vegetative growth: late autumn or early winter following good rains Flower bud production: late winter Peak flowering period: August to October Flowering may be enhanced by summer fires	Similar species: not specified
Pterostylis sp. Halbury (R.Bates 8425) (Halbury greenhood) syn. *P. lepida*	Endangered	SA	In open mossy clearings, gaps and pathways between trees and shrubs	Vegetative growth: rosette in May to June Flower bud production: July to October Peak flowering period: mid-August and early November	Similar species: Boormans rustyhood (*Pterostylis boormanii*), morphologically similar ruddyhood (*Pterostylis pusilla*)
Pterostylis sp. Hale (R.Bates 21725) SA Herbarium) (Hale dwarf greenhood)	Endangered	SA	Mallee and in heathy woodland	Peak flowering period: August to September	Similar species: *Pterostylis nana* complex
Pterostylis sp. Northampton (S.D.Hopper 3349)	Endangered	WA	Winter-wet areas among low scrub heath. Populations	Peak flowering period: early August to early	Similar species: *Pterostylis mutica*

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
WA Herbarium (Northampton midget greenhood), syn *P. sinuata*			also found on sandy loam slopes with low shrubs	September Dormant between October and late April Prefers open, well lit, moist areas and disappears when density of vegetation increases	
Pterostylis tenuissima Nicholls (swamp greenhood)	Vulnerable	Victoria and south-east SA	*Leptospermum lanigerum* tall closed shrubland in swamps or along watercourses that are seasonally inundated with freshwater	Peak flowering period: mainly between October and February, but has been observed throughout the year	Similar species: not specified
Pterostylis valida (Nicholls) D.L.Jones (robust greenhood)	Critically endangered	Victoria	Granite slopes in shallow pockets of soil in open woodland	Peak flowering period: October and November	Similar species: those of the *Pterostylis excelsa* complex
Pterostylis wapstrarum D.L.Jones (fleshy greenhood)	Critically endangered	Tasmania	Native grassland and grassy woodland (*Eucalyptus pauciflora* and *Eucalyptus viminalis*) on basalt and dolerite soils	Peak flowering period: October to November	Similar species: species in the *P. mutica* complex (*P. mutica, P. rubenachii, P. wapstrarum*) and *P. cycnocephala* complex (*P. pratensis, P. ziegeleri*)
Pterostylis x *aenigma* D.L.Jones & M.A.Clem. (enigmatic	Endangered	Victoria	Floodplains of montane watercourses among grasses and sedges	Peak flowering period: November and December	Similar species: *Pterostylis falcata* and *Pterostylis cucullata*

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
greenhood)			in woodland and open forest		
Pterostylis xerophila M.A.Clem. (desert greenhood)	Vulnerable	SA, Victoria	Semi-arid regions in open mallee scrublands, on 'buckshot' rise under thickets of *Melaleuca uncinata* and on sand dunes under *Leptospermum coriaceum*	Flower-bud formation: August to September Peak flowering period: August to December, but mostly in October and November Morphology of the flowers of Victorian plants varies considerably between populations	Similar species: *P. xerophila*
Pterostylis ziegeleri D.L.Jones (grassland greenhood)	Vulnerable	Tasmania	Slopes of low, stabilised sand dunes and in grassy dune swales in coastal areas, while in the midlands it grows in native grassland or grassy woodland on well-drained clay loams derived from basalt	Peak flowering period: September to December, with peak in October	Similar species: the *P. mutica* complex (*P. mutica, P. rubenachii, P. wapstrarum*) and *P. cycnocephala* complex (*P. pratensis, P. ziegeleri*)
Rhinerrhizopsis matutina D.L.Jones & M.A.Clem.	Vulnerable	Queensland	Epiphyte in notophyll vine forests and in semi-deciduous mesophyll vine forest	Peak flowering period: flowering is erratic with the main period being from July to September	Similar species: No

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
Rhizanthella gardneri R.S.Rogers (Western Australian underground orchid)	Endangered	WA	Grows in thickets with broom bush (*Melaleuca* spp.)	Peak flowering period: May to June (northern populations) and June to July (southern populations) Dormant between October and late April	Similar species: has been confused for the underground fungi stink-horn fungus (*Colus pusillus*) and earthstar fungus (*Geastrum* spp.) as well as a parasitic angiosperm *Orobanche minor*
Rhizanthella slateri (Rupp) M.A.Clem. & P.J.Cribb (eastern underground orchid)	Endangered	NSW	Terrestrial saprophytic; *Eucalyptus* forest	Peak flowering period: October and November	Similar species: not specified
Sarcochilus fitzgeraldii F.Muell. (ravine orchid)	Vulnerable	NSW, Queensland	Epilithic or terrestrial herb, rarely an epiphyte. On rocks or escarpments in moist, heavily shaded conditions in ravines; usually near streams and waterfalls; in wet sclerophyll forest and subtropical rainforest	Peak flowering period: October to November	Similar species: *S. hartmannii*
Sarcochilus hartmannii F.Muell. (waxy sarcochilus)	Vulnerable	NSW, Queensland	Lithophytic herb, occasionally epiphytic. Exposed, rocky bluffs and slopes, or sclerophyll forests, but	Peak flowering period: September to November	Similar species: *S. aequalis* and *S. fitzgeraldii*

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
			sometimes grows near creeks		
Sarcochilus hirticalcar (Dockrill) M.A.Clem. & B.J.Wallace	Vulnerable	Queensland	Rainforest species, grows on rainforest trees, favouring flaky-barked trees	Peak flowering period: November and December	Similar species: not specified
Sarcochilus roseus (Clemesha) Clemesha	Vulnerable	Queensland	Epiphytic evergreen; in dryish exposed or semi-exposed	Peak flowering period: October to December	Similar species: *S. ceciliae*
Sarcochilus weinthalii F.M. Bailey (blotched sarcochilus)	Vulnerable	NSW, Queensland	Epiphytic on trees in dry rainforest at altitudes	Peak flowering period: August to October	Similar species: not specified
Spathoglottis plicata Blume	Vulnerable	Queensland	Grows in or near swamps and in grassy patches near streams	Peak flowering period: any time between July and April but the main season is from September to April	Similar species: *S. paulinae*
Taeniophyllum muelleri Lindl. ex Benth. (minute orchid)	Vulnerable	NSW, Queensland, Norfolk Island	Epiphyte of rainforest and vine forest (open and closed)	Peak flowering period: not specified	Similar species: *Taeniophyllum norfolkianum*
Taeniophyllum norfolkianum D.L.Jones, B.Gray	Vulnerable	Norfolk Island	Epiphytic orchid. Underside of branches of the	Peak flowering period: August to October	Similar species: very similar to *T. muelleri*

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
& M.A.Clem. (minute orchid)			Norfolk Island pine in shaded gullies and lower slopes in closed forests		
Thelymitra cyanapicata Jeanes (blue top sun-orchid)	Critically endangered	SA	Manna gum (*Eucalyptus viminalis*), messmate (*Eucalyptus obliqua*), open swampy woodland	Peak flowering period: October and early November The flowers open only in warm, humid weather	Similar species: others in the *Thelymitra pauciflora* complex
Thelymitra epipactoides F.Muell. (metallic sun-orchid)	Endangered	SA, Victoria	Mesic coastal heathlands, grasslands, sedgelands and woodlands, but is also found in drier inland heathlands, open forests and woodlands	Vegetative growth: leaves can be seen as early as April and continue to grow throughout winter. Peak flowering period: August to November Flowering plants are often only found after fires Flowers open when the relative humidity is lower than 52%, air temperature is above 15 °C, and there are clear skies	Similar species: *T. grandiflora*
Thelymitra jonesii Jeanes (sky-blue sun-orchid)	Endangered	Tasmania	Moist coastal heath on sandy to peaty soils and *Eucalyptus obliqua* forest in deep loam soils over	Peak flowering period: about a week either side of 1 November This species responds	Similar species: *Thelymitra azurea* and *Thelymitra occidentalis*

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
			dolerite	strongly to hot fires	
Thelymitra kangaloonica Jeanes	Critically endangered	NSW	Seasonally swampy sedgeland, highly localised, being restricted to the Temperate Highland Peat Swamps on Sandstone	Peak flowering period: late October and early November The strongly scented flowers open fairly readily on sunny days. Surveys within the known locations require methodical surveying of the main swamps (Butler's Swamp and Stockyard Swamp)	Similar species: species of sun-orchids (*Thelymitra* spp.)
Thelymitra manginii R.S.Rogers (cinnamon sun orchid)	Endangered	WA	Open wandoo woodland in granite areas	Peak flowering period: early November Dormant between December and late April	Similar species: *Thelymitra stellata*, *T. jacksonii* and *T. yorkensis*
Thelymitra matthewsii Cheeseman (spiral sun-orchid)	Vulnerable	SA, Victoria	Open forests and woodlands	Peak flowering period: late August to early October It is a post-disturbance coloniser	Similar species: *T. spiralis* (WA)
Thelymitra psammophila C.R.P.Andrews (sandplain sun-	Vulnerable	WA	Sandy-clay and lateritic claysoil in open heath and sedges	Peak flowering period: September to early October Dormant between	Similar species: *Thelymitra flexuosa*

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
orchid) *Thelymitra stellata* Lindl. (star sun-orchid)	Endangered	WA	Lateritic soil, growing amongst low heath and scrub in jarrah (*Eucalyptus marginata*) woodland, on ridges, slopes, and breakaways	November to late April Peak flowering period: late September in northern populations and October to November near Perth. Flowers remain closed overnight and during cool overcast weather	Similar species: *Thelymitra magnifica*
Thelymitra xmackibbinii F.Muell. (brilliant sun-orchid)	Vulnerable	Victoria	Woodlands within box-ironbark associations	Flowering occurs from early September to early October	Similar species: not specified
Thynninorchis nothofagicola (D.L. Jones) D.L Jones & M.A,Clem. (myrtle elbow orchid)	Critically endangered	Tasmania	Tall, open *Eucalyptus delegatensis* forest with a rainforest under-storey of *Nothofagus cunninghamii*, *Atherosperma moschatum* and *Dicksonia antarctica*; grows in leaf litter; single known site	Peak flowering period: late February	Similar species: not specified
Trichoglottis australiensis Dockrill	Vulnerable	Queensland	Grows on rainforest trees	Peak flowering period: March but flowering time is possibly variable or blooming may occur	Similar species: not specified

Species name	EPBC threatened status	Distribution	Landscape-scale habitat	Peak detectability	Similar species
				several times a year	
Vanda hindsii Lindl. (Cape York vanda)	Vulnerable	Queensland	Epiphyte, lithophytes rain forest margins, notophyll vine forest, deciduous vine thicket and open forest	Peak flowering period: erratic but mostly in the summer months	Similar species: *Pomatocalpa marsupiale*
Vrydagzynea grayi D.L.Jones & M.A.Clem.	Endangered	Queensland	Dense, lowland rainforest	Peak flowering period: September to October	Similar species: not specified
Zeuxine polygonoides (F.Muell.) P.J.Cribb (velvet jewel orchid)	Vulnerable	Queensland	Moist shady sites in rainforests (mesophyll vine forests and simple notophyll vine forests) in leaf litter on the ground or on large boulders adjacent to streams	Vegetative growth: late summer to spring The velvet jewel orchid is readily recognised when in leaf (late summer to spring) by the white central band on the leaf blades	Similar species: not specified