

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

1. Scientific name (common name)

Reedia spathacea (Reedia)

2. Reason for Conservation Assessment by the Committee

This advice follows assessment of information provided by a public nomination to list Reedia as **vulnerable**. This is the Committee's first consideration of the species under the EPBC Act.

3. Summary of Conclusion

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

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

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

4. Taxonomy

The species is conventionally accepted as *Reedia spathacea* (Reedia) (Mueller, 1859).

5. Description

Reedia is a robust, tufted sedge with a woody trunk (caudex) that forms large leafy clumps to over 1 m in height. The leaves are about 1 m in length, bordered by prickles, and originate from a single apical shoot at the top of the caudex. The Reedia flower spike reaches up to 3 m in height and is loosely enclosed by several pale yellow, papery leaves. At the height of flowering the small, simple brown flowers emit a strong fragrance, and are pollinated by bees and small beetles (Tauss, 2000, pers. comm., 2007).

6. Distribution

Reedia occurs as 27 disjunct populations in two discrete geographical regions in south-west Western Australia — the Walpole region and the Blackwood Plateau. Reedia is a Gondwanan relict species, and its current distribution is suspected to be the remains of a wider distribution during wetter conditions during the early and middle Tertiary period (Tauss, 2000, pers. comm., 2007; Semeniuk, pers. comm., 2008).

7. National Context

Reedia is currently listed as Declared Rare Flora under the *Western Australian Wildlife Act 1950*. It is not currently listed under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act).

8. Relevant Biology/Ecology

Reedia is a plant species that has specialised to grow in permanently-waterlogged, low nutrient wetlands in south-west Western Australia. These wetlands are either muddy floodplains or waterlogged peat slopes. These habitats are uncommon summer wetland refugia in a region with a Mediterranean climate that otherwise experiences prolonged summer drought. These wetlands are usually very stable environments with constantly high groundwater tables and waters that are consistently low in salinity and nutrients. The constantly anoxic, nutrient-restricted and often highly acidic conditions in these wetlands exclude many of the common wetland plants and animals that are found in the more abundant (seasonal) wetlands of the region that dry out in summer. Reedia however is well adapted to these habitats. Reedia is very unusual and has an extremely complicated biology compared to other Australian members of the Cyperaceae family, and appears to have several specific adaptations to its waterlogged environment:

- Most of the living parts of the plant, including starch storage areas, root initiation points and the apical shoot are found only in the small area at the top of the caudex.
- The roots of the plant are all stem-borne (i.e. they originate exclusively on the top of the caudex) and grow down the side of the caudex through a mass of dead leaf bases and decaying plant matter to the groundwater table.
- Clonal growth, where new caudices branch off laterally from near the top of senescing older caudices, is the main form of reproduction and leads to an extremely variable range of complicated growth forms.
- Dead leaves are retained, presumably to re-draw scarce nutrients.
- The leaf sheaths form water tanks somewhat like those of bromeliad species.
- The stem-borne roots form horizontal branches below the surface and bear small upwardly-growing rootlets that protrude just above ground level, like the pneumatophores of some mangroves. These rootlets appear to oxygenate the root zone of Reedia.

In general, the structure of a mature, long-established Reedia plant can be seen as one or more large apical shoots with dense leaves perched on top of a mass of slowly decaying shoots from previous seasons, with their roots weaving down through the dead matter to connect the plant to the shallow water table. Growth is slow (Tauss, 2000, pers. comm., 2007).

In optimum, undisturbed habitat Reedia forms closed, tall sedgelands and can be considered a keystone species, as it is the dominant structural component, provides the bulk of live biomass and is a major component of the peat substrate. Currently it cannot be established how many Reedia individuals are ramifying clones (ramets) and how many are genetically distinct individuals from fertilised seed (genets) (Tauss, 2000, 2004a, 2004b, pers. comm., 2007).

Generation length is not known. It is suspected that Reedia ramets may be many decades old, conversely the individual live shoots can be relatively short lived (3–10 years or more on current unpublished data) before they flower and senesce. Reedia populations have been observed to be very variable in their reproductive behaviour (Tauss, 2000, pers. comm., 2007).

As mentioned above, clonal growth is the main form of reproduction in stable conditions. Nevertheless, the species puts significant investment into occasional (multi-year-interval) flowering events, with the strongly fragrant flowers attracting numerous bees for pollination. However, seed viability in Reedia is low, with less than 5% germination observed in trials to date, and the seeds have no obvious morphological features that would aid dispersal. Seedling

germination has been observed in most populations in the absence of any disturbance. However, few seedlings survive in the long term due to overshadowing from surrounding vegetation. Sexual reproduction from seed has been observed to be most effective after severe disturbance, such as fire events, has significantly thinned or destroyed the adult *Reedia* population and other vegetation.

Thus *Reedia* appears to have two possible recruitment strategies; clonal reproduction during the normal stable conditions found in the *Reedia* wetlands and sexual reproduction from seed that is most effective after disturbance events. Soil seed banks are presumed to be low. (Tauss, pers. comm., 2007).

9. Description of Threats

Feral pigs

Reedia is extremely vulnerable to grazing by feral pigs (*Sus scrofa*) due to its morphological characteristics and reproductive behaviour, i.e. growth points for both roots and apical shoots emerge at the top the caudex. Feral pigs find these points palatable and specifically target them. The removal of these critical points kills the plant (Tauss, 2000, pers. comm., 2007).

Feral pigs pose the major threat to the species as they have been introduced by recreational pig hunters into *Reedia* habitats in the last few years and their numbers and impacts are expanding rapidly. The nominator advises that feral pigs destroyed one 3 ha population in 2 years (Tauss, pers. comm., 2007).

Fire

The apical shoots and root initiation zone of *Reedia* are in close proximity to large masses of flammable old leaves, which the plant presumably retains to re-draw scarce nutrients. Even the coolest fires have been observed to kill a significant proportion of adult shoots and around half of juveniles up to 8 years old (Tauss, pers. comm., 2007). Hotter fires generally cause great losses with deep burns on the caudices of the dead plants that totally sever the roots. *Reedia* shoots do not flower every year and even a mild fire will cause the entire population thus affected to cease flowering for at least one or two years post fire (Tauss, 2000, pers. comm., 2007).

Reedia populations and habitats are found in many areas (state forest and crown land) that are subject to a prescribed burning regime on a short cycle by the WA Department of Environment and Conservation (DEC). This regime (combined with drier climatic conditions and wildfires) has reportedly caused significant damage to *Reedia* populations (Tauss, pers. comm., 2007) and the peat layers in some of the wetlands (Semeniuk, pers. comm., 2008). Most *Reedia* populations with peat substrates are currently routinely burnt in prescribed fires (approximately every 7 years) (Tauss, pers. comm., 2007).

Groundwater abstraction and modification

Groundwater abstraction poses a major threat to *Reedia*. Groundwater in the region is increasingly being drawn for use in local agriculture, viticulture and urban water supply. Any significant tapping of local groundwater systems that maintain *Reedia* wetlands will risk drying out the waterlogged environments in which *Reedia* grows (Tauss, 2000; 2004a, 2004b, pers. comm., 2007).

Other activities that change groundwater hydrology and catchment areas also pose a major threat to *Reedia*. For example, a residential development being built in the recharge zone of a groundwater system that maintains a significant *Reedia* population at Walpole is currently

draining the groundwater in the development site and diverting this into the Walpole River. These changes to the underground hydrology of the wetland's catchment pose a serious threat to the *Reedia* population (Tauss, pers. comm., 2007).

Weeds

Several *Reedia* populations are now threatened by invasions of aggressive exotic wetland weed species such as *Isolepis prolifera* (Budding Club-rush) (Tauss, pers. comm., 2007).

Nutrient enrichment

Nutrient enrichment from leaking septic tanks and agricultural practices pose a threat to the species which is adapted to an extremely low nutrient environment. Nutrient enrichment will potentially affect the health and growth of *Reedia* and will assist competing species to become dominant, altering the composition of the wetland plant communities in which *Reedia* grows (Tauss, 2000).

10. Public Consultation

The nomination used in this assessment was made available for public exhibition and comment for 31 business days. No public comments were received.

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

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

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

As *Reedia* is a ramifying plant species with complicated growth forms, population estimates by counting individuals is subjective and inaccurate. Area of occupancy, based on extrapolations from quadrats where percentage of cover is estimated, is accepted as an appropriate measure of population and of decline.

Limited historical data exists for the distribution of *Reedia* but provides little precision.

However, field monitoring and aerial surveys indicate *Reedia*'s current area of occupancy has declined by at least 34.65 ha or 43% since 1992. Specific events include the death of thousands of adults at Spearwood Swamp after fire in 1997 and the recent extirpation of a population in Pingerup by feral pigs over the course of two years (2000–2001). The majority of the 27 remaining *Reedia* populations are continuing to decline (Tauss, pers. comm., 2007; Atkins, unpublished data, 2007).

These declines are substantial in light of the species': extreme vulnerability to fire and feral pig grazing; slow, predominately clonal growth habits; sporadic flowering; extremely low seed viability; and the rarity of recruitment from seed.

The Committee considers that the species has undergone a reduction in numbers over the last 15 years. As a ramifying plant species, generation length cannot accurately be defined, however the Committee considers the reduction in numbers to have been severe. Therefore, the species has been demonstrated to have met the relevant elements of Criterion 1 to make it **eligible** for listing as **endangered**.

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

Reedia utilises relatively rare wetland habitats formed and maintained by specific geomorphological and hydrological features in south-west Western Australia, namely seasonally inundated slopes and, to a lesser extent, floodplains (Semeniuk & Semeniuk, 1995; Tauss, 2000, 2004b, pers. comm., 2007). In 2007, the current total area of occupancy was approximately 44.92 ha or 0.449 km² (Tauss, pers. comm., 2007). The Committee judges this geographic distribution to be very restricted, particularly given the species' specific, very limited habitats, its slow, predominantly clonal growth habits and rare seed recruitment events.

The species appears to be susceptible to a range of threats (see Section 8). Any of these, but fire and feral pigs in particular, can rapidly extirpate surviving individual populations, and have extirpated some populations recently. The Committee judges that the species' very restricted geographic distribution is precarious for the survival of the species.

Therefore, the species has been demonstrated to have met the relevant elements of Criterion 2, and **eligible** for listing as **critically endangered**.

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

- (a) evidence suggests that the number will continue to decline at a particular rate; or
- (b) the number is likely to continue to decline and its geographic distribution is precarious for its survival

As Reedia is a ramifying plant species with complicated growth forms, total number of mature plants is not known. Area of occupancy is used as an accepted measure of abundance in some contexts. However, area of occupancy is considered insufficient to estimate whether the total number of mature individuals is limited to a particular degree. Reedia's area of occupancy has declined by 34.65 ha or 43% and is continuing to decline but at an unknown rate. As described at Criterion 2, the species' geographic distribution is precarious. However, as the species has not been demonstrated to have met this required element of Criterion 4, it is **not eligible** for listing in any category under this criterion.

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

As Reedia is a ramifying plant species with complicated growth forms, total number of mature plants is not known. Area of occupancy is used as an accepted measure of abundance in some contexts. However, this is considered insufficient to estimate whether the total number of mature individuals is very low, low or limited. Therefore, as the species has not been demonstrated to have met this required element of Criterion 4, it is **not eligible** for listing in any category under this criterion.

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

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

No quantitative (statistical) analyses have been carried out to estimate a probability of extinction of the species in the wild over a relevant timeframe. Therefore, as the species has not been demonstrated to have met the required elements of Criterion 5, it is **not eligible** for listing in any category under this criterion.

12. CONCLUSION

Conservation Status

Reedia spathacea (Reedia) was nominated for inclusion in the list of threatened species referred to in section 178 of the EPBC Act. The nominator suggested listing in the **vulnerable** category of the list.

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

The Committee judges that the species has a very restricted geographic distribution, which is precarious for the survival of the species due to its specific, very limited habitats, clonal growth habits and rare seed recruitment events. Therefore, the species has been demonstrated to have met sufficient elements of Criterion 2 to make it **eligible** for listing as **critically endangered**.

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

Recovery Plan

A single species recovery plan is not considered to be an efficient use of resources at this time. A regional recovery plan may be more appropriate, however further investigations are required. The Committee considers that the proposed conservation advice is sufficient to guide conservation and recovery actions during those investigations.

13. Recommendations

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

Reedia spathacea (Reedia)

- (ii) The Committee recommends that there should not be a recovery plan for this species at this time.

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Chair
Threatened Species Scientific Committee

14. References utilised in the advice

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