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# **Recovery plan for *Acacia porcata* 1999 – 2001**

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# 1 Summary

## 1.1 Current species status

*Acacia porcata* P.I. Forst. is known from a single location 45km south-east of Mundubbera, south-east Queensland, on a grazing homestead perpetual lease. Nine populations totalling 1177 individuals are located over 6km. The species is not conserved in any reserve. *A. porcata* is listed in the Queensland and Commonwealth Government schedules of threatened wildlife as 'endangered'.

*A. porcata* is considered endangered because of its (i) low population number, (ii) low number of individuals, and (iii) all populations are in habitats considered to be insecure against imminent threats.

## 1.2 Habitat requirements and limiting factors

*A. porcata* grows on exposed rocky ridges on shallow, sandy, well-drained, weakly acidic soils derived from granite. Perceived threats to the long-term viability of the species in the wild are an inappropriate fire regime, the lack of long-term habitat security and genetic isolation.

## 1.3 Recovery objectives

The ultimate objectives of the recovery plan are to ensure the habitat of *A. porcata* is secure from any threats that would have a detrimental effect on the species' long-term viability, and to maintain sustainable population levels in the wild in the long term with minimum management. These objectives, considered achievable within 15 years of implementing this plan, would allow the re-listing of the species from 'endangered' to 'vulnerable'.

## 1.4 Recovery plan objectives

- Improve the conservation status of *A. porcata* from 'endangered' to 'vulnerable' (ANZECC) within 10 years
- Investigate the ecology and genetics of the species to enable decisions about management
- Achieve controlled cultivation of *A. porcata*

## 1.5 Recovery criteria

- Maintain and increase existing population levels of *A. porcata* in the wild
- Obtain environmental protection for populations
- Understand the population dynamics, reproductive biology and genetic diversity of *A. porcata*
- Establish the role of fire in the ecology of the species

## 1.6 Actions needed

**Action 1** Undertake further surveys to try to locate new populations

**Action 2** Provide secure habitat by negotiating a conservation agreement with the lessee and managing authority

**Action 3** Monitoring population levels for the purpose of detecting any detrimental effects of management (This can be carried out as part of Action 4.1.)

**Action 4** Undertake ecological and biological investigations:

**4.1** Investigate the population dynamics and reproductive biology of the species by permanently tagging individuals and monitoring the life history

**4.2** Investigate the genetic diversity of *A. porcata*

**4.3** Investigate aspects of seed biology with attention to seedbank dynamics

**4.4** Investigate the role of fire in the ecology of *A. porcata*.

**Action 5** Undertake controlled cultivation and propagation ensuring the representative sampling of the genetic diversity of the species. Depending on outcomes from Action 4, consider appropriate actions concerning reintroduction or translocation of individuals to suitable sites, or mechanisms to allow the establishment of the newly evolving species.

## 1.7 Estimated costs of recovery

Year	Action 1	Action 2*	Action 3	Action 4	Action 5	Total
1999	2000	0	8875	8875	0	19 750
2000	2000	unknown	1025	1025	250	4 300
2001	2000	unknown	0	0	250	2 250
<b>Total</b>	<b>6000</b>	<b>unknown</b>	<b>9900</b>	<b>9900</b>	<b>500</b>	<b>26 300</b>

\* this action will be completed by 2001, if the lessee is willing to negotiate. This action is not reliant on funding.

## 1.8 Biodiversity benefits

The area where *A. porcata* occurs has outstanding value for nature conservation with the presence of several rare and threatened plants. These include *Newcastelia velutina* Munir, *Acacia eremophiloides* Pedley & P.I. Forst. and *Acacia grandifolia* Pedley. Other rare species that are in the area include *Acacia tenuinervis* Pedley, *Hibbertia monticola* Stanley, *Kunzea flavescens* C.T.White & W.D. Francis and *Eucalyptus petalophylla* Brooker & Bean.

## 2 Background

The genus *Acacia* in Australia comprises approximately 750 species of shrubs and trees which are widely dispersed throughout the continent with a large range of foliage and flower types. *A. porcata* belongs to the section *Lycopodiifoliae* in the genus *Acacia* in the family *Mimosaceae* (Forster 1990). As with other species in this section *A. porcata* has its phyllodes arranged in regular whorls.

*A. porcata* was described by P.I. Forster in 1990 from material collected by P.I. Forster and C.G. Wilkinson in the Burnett district of south-east Queensland. The specific epithet alludes to the ridged nature of the outside of the pod and to the hilly nature of the habitat. *A. porcata* appears to be closely related to *Acacia longipedunculata* but differs by having a longitudinal ridge on the outside of the pod and lacks conspicuous ribs or thickenings on the calyx tube. The geographic ranges of *A. porcata* and *A. longipedunculata* are widely separated.

### 2.1 Description of species

A detailed description of the species is as follows:

Decumbent shrub less than 0.5m tall; branchlets terete, resinous, becoming greyish, indumentum of dense, stiff, white hairs 1–1.5 mm long; internodes to 3cm long, 2–3mm diameter. Phyllodes +/- terete, 5–30 mm long, 0.51mm diameter, venation obscure, tapered at the base and abruptly contracted at the apex into a mucro c. 0.25mm long, straight or slightly incurved in upper part, viscid, olive-green, with sparse covering of white hairs similar to those on branchlets, 13–19 per whorl: stipules persistent similar in number to phyllodes in whorl, brown, upright, subulate, deep red-brown, to c. 1mm long. Heads 35–40-flowered, globular; peduncles 10–20mm long, usually much longer than the phyllodes, viscid; bracteoles linear-lanceolate, c. 2mm long and 0.5mm wide, with stiff white hairs. Flowers 5-merous; calyx tube 1–1.25mm long, c. 1mm diameter; lobes lanceolate-ovate, tips strongly incurved, 0.75–1mm long, c. 0.5mm wide, with few sparse hairs externally; corolla tube c. 1mm long and 1mm diameter; lobes ovate-lanceolate, not striate, 1–1.5mm long, c. 0.5mm wide, with few sparse hairs externally; stamens c. 2–3.5mm long; anthers 0.1–0.2mm long; pistil 3–3.5mm long, glabrous; ovary c. 1mm long and 0.5mm wide, glabrous. Pod sessile, flat, viscid, 11–27mm long, 5–6mm broad, conspicuously ridged externally along middle above seeds, containing 1–4 seed, dehiscent. Seed arranged longitudinally in pod, black, shiny, slightly viscid, with slight ridge on side, c. 5mm long, 35mm broad and 1.5mm thick; aril white, c. 2mm long (Forster 1990) (Plates 1 and 2). Line drawings of branchlet, flower, fruit and seed are given in Forster (1990).

### 2.2 Distribution

*A. porcata* is found in a small area in the Mundubbera Shire in the Burnett district of south-east Queensland. The type locality at Beeron Holding, also known as Rocky Paddock, is the only known occurrence of *A. porcata*. It is situated 46km SSW of Gayndah and 45km south-east of Mundubbera in the Parish of Beeron, County of Newcastle.

The tenure of the land is a grazing homestead perpetual lease with the Department of Natural Resources controlling the timber rights. The lease is used primarily for cattle grazing but in the past has been logged selectively for a number of eucalypt species. The rough topography and the unsuitability of the vegetation on the steep slopes as feed for grazing animals have limited the amount of disturbance of this area. Freehold pastoral holdings adjacent to the lease have been cleared selectively and are used primarily for cattle grazing.

Nine populations of *A. porcata* are known over 6km within Beeron Holding. By August 1998, 1172 plants of *A. porcata* were counted. The number of plants by site is summarised in table 1.

#### Site 1

This is the site of the original collections made by P.I. Forster in 1988 and 1990 when *A. porcata* was known only from six plants (Forster 1990). During the 1993 survey, a total of 79 plants was counted. This was increased to 112 plants in the 1996 surveys. Most occur on a rocky platform of approximately 75sq.m. A large number of dead seedlings was located near the type specimen about 200m down the ridge from the main population. Scattered plants have been located between the main population and the type specimen. The type specimen died in 1998.

#### Site 2

Thirty-six *A. porcata* plants were counted on this site of approximately 500sq.m. This site seems to have been burnt about the mid-1980s. Most of the 1993 population comprised young plants (30 individuals) of an even age that appeared to have germinated after the fire. All mature individuals were growing on a rock platform protected from fire. The 1996 survey found most seedlings dead, with only 11 plants surviving. The area of the plants covered about 260sq.m. This site would appear to be highly susceptible to extinction. The census in 1998 recorded 18 plants of which nine were seedlings in 1996–97.

#### Site 3

This site comprises a long ridge with three sites occurring within 700m. Lower slope plants occurred on a rock slab protected from fire. In 1993, a single individual was located on a cattle path on the crest of a ridge in an open stand of *A. grandifolia*. The 1996 survey located three distinct populations, including three plants at the 1993 site, six plants on one crest and 51 plants in a third pocket. A large number of dead seedlings was also located off the crest of one of the ridges. The 1998 census recorded 72 plants, with only two seedlings.

#### Site 4

This site was located in 1996. Plants were found in three distinct pockets over 4.6ha with most occurring within 1ha. Again, most plants, particularly older plants, occurred on rock slabs protected from fire. Seedlings occurred close to the mature plants, often in small gullies, or where water flows. The 1998 census recorded 143 plants.

#### Site 5

This site on the crest of a small ridge covers about 500sq.m. One mature plant protected from fire was located. Many other plants were dead or in very poor condition. This site appears to be highly susceptible to extinction. The 1998 census recorded 31 plants.

#### Site 6

This site is very different from all others because it faces N and SE, rather than W/NW. A total of 460 live plants of varying ages was located. Germination events were evident, with large numbers of plants surviving. In contrast with all other sites, many of the plants were located in a dense stand of *Grevillea whitei*. *A. porcata* also occurred in lower slope positions than in all other sites. Plants occur in an area of approximately 4ha. As in the other sites, dense pockets of plants occur. The 1998 census recorded 605 plants.

#### Site B

This site comprises a small area of rocky outcrop with plants protected from fire. Plants were of similar age, with small numbers of seedlings. The plants were scattered over approximately 1200sq.km. The 1998 census recorded 43 plants.

#### Site C

Plants occur over 6250sq.m on the crest of a ridge. A small number of very old, mature plants was located some distance from a large number of plants from same age germination. A number of dead seedlings was also evident. The old mature plants occur in fire-protected areas. The 1998 census recorded 93 plants.

## Site E

This is the most remote site, occurring on a rocky slab on the side of a ridge about 2km from the next nearest site. Plants at this site were of similar age, although more dispersed than at many of the other sites. The plants occur over about 500sq.m. This site would also appear to be highly susceptible to extinction. The 1998 census recorded 50 plants.

Table 1. Number of plants by site.

Site	total number of plants 1998	total number of plants 1997	total number of seedlings 1996	number of seedlings/year 1997	number of seedlings/year 1998
1	118	112	4	1	3
2	18	11	9	5	4
3	72	67	2	2	—
4	143	74	7	—	7
5	31	24	2	—	2
6	605	460	4	3	1
B	43	33	3	2	1
C	97	46	10	1	4.5
E	0	9	1	—	1
<b>Total</b>	<b>1177</b>	<b>836</b>	<b>42</b>	<b>14</b>	<b>23.5</b>

## 2.3 Habitat

The climate is subtropical and subcoastal, with hot, moist summers and mild, dry winters. Nearby Mundubbera has an average annual rainfall of 707mm and Proston 731mm. About 40 percent of the average rainfall is received in summer.

The area is characterised by steep hills and V-shaped valleys with extensive rock outcrops. The hills range between 400 to 548 metres. Local relief ranges from 80 to 180 metres. Toondahra granite is the principal rock of these hills. The soils are shallow, coarse, textured, loamy sands, weakly acidic and dark due to high organic content.

Due to extensive areas of rock outcrop, vegetation is variable in density and structure. Vegetation is predominantly open forest or open woodland with an open to sparse shrub layer. In the upper stratum *Eucalyptus exserta*, *Eucalyptus petalophylla* and *Eucalyptus dura* co-dominate with *Acacia grandifolia*, *Allocasuarina inophloia* and *Callitris endlicheri* occasionally occurring. The understorey is diverse in composition and structure. Much of the area is dominated by *Triodia pungens*. Other frequent species are *Leptospermum polygalifolium*, *Xanthorrhoea johnsonii*, *Acacia eremophiloides*, *Cleistochloa rigida*, and *Pomax umbellata* and an unidentified species of *Aristida*.

The habitat of *A. porcata* has outstanding value for nature conservation with the presence of several threatened plant species. These include *Newcastelia velutina* Munir (Verbenaceae), *Acacia eremophiloides* Pedley & P.I.Forst. (Mimosaceae) and *Acacia grandifolia* Pedley (Mimosaceae). Other rare species that are in the area include *Acacia tenuinervis* Pedley (Mimosaceae), *Hibbertia monticola* Stanley (Dilleniaceae), *Kunzea flavescens* C.T.White & W.D. Francis (Myrtaceae) and *Eucalyptus petalophylla* Brooker & Bean (Myrtaceae). There appears to be a number of undescribed species in the area and these include: *Bertya* sp. (Beeron Holding P.I.Forster 5753) (Euphorbiaceae), *Cryptandra* sp. (Ngungun L.S. Smith 13973) (Rhamnaceae) and *Commersonia* sp. (Beeron P.I.Forster 4658) (Sterculiaceae). The area also contains significant distributional records for *Grevillea singuliflora* F.Muell. (Proteaceae), *Eucalyptus dura* L.A.S.Johnson and K.D.Hill (Myrtaceae), *Anacampseros australiana* J.M.Black (Portulacaceae) and *Aotus subglaucula* var. *filiformis* (Fabaceae).

## 2.4 Life history and ecology

### General

*A. porcata* is a perennial shrub. However, the longevity of individual plants is unknown. Field observations suggest that, left unburnt, individuals could survive at least 10 years.

### Fire history

Fire history for the habitat of *A. porcata* is unknown. Because of the sparse vegetation and the large proportion of substrate outcropping in this habitat, fires on these slopes historically would seem to be relatively infrequent but of high intensity due to fuel accumulation. They are likely to occur in the spring and early summer months.

Based on field observations, fire is suspected of killing *A. porcata* shrubs with no regeneration from root or stem shoots. To maintain a continued existence at a site that was burnt *A. porcata* would be dependent on successful seed germination and establishment from the soil-based seedbank. Inappropriate fire regimes most likely have eliminated *A. porcata* from suitable but more fire-prone habitats along these ridges.

Only one site has been burnt since monitoring of the population started in 1996. A number of mature plants were killed in the fire. No germination of new seedlings has been observed to date.

### Propagation and cultivation

No attempt has been made to cultivate this species of attractive shrub. Seed is easily germinated by scarification of the seed coat or by placing the seed into boiling water. Seeds from germination trials have been potted but have failed to survive more than three months in glasshouse conditions at the Agriculture Research Institute, Brisbane. Elliot and Jones (1982) report that many *Acacia* species can be propagated from cuttings, best results being achieved with cuttings of firm, new season's growth.

### Phenology

Herbarium records and field observations indicate that *A. porcata* flowers from August to late September. Tables 2 and 3 give the number of flowering plants by site, and the number of inflorescences by plant. Pollinators have not been observed. Studies of pollinators of other *Acacia* species indicate they are primarily insect-pollinated (Bernhardt 1989).

Table 2. Number of flowering plants by site.

Site	1	2	3	4	5	6	B	C	E	Total
Number of flowering plants	101	6	48	38	7	143	15	19	8	385
Percentage of plants in flower	90	54	72	51	29	32	45	41	88	46

Table 3. Number of inflorescences by plant.

Inflorescence number/plant	1	2	3	4	5	6	B	Cc	E	Total
1 – 9	13	1	14	8	4	89	7	2	2	140
10 – 19	8	2	14	7	0	21	0	0	2	54
20 – 29	5	0	5	0	0	8	0	3	1	22
30 – 49	6	0	4	0	0	6	2	4	1	23
50 – 99	17	0	6	3	0	12	1	1	2	42
100 – 199	23	1	4	6	0	2	1	5	0	42
200 – 499	15	2	1	5	0	1	3	3	0	30
500 – 800	4	0	0	7	1	0	0	1	0	13

*A. porcata* is self-compatible.

### Seed development and germination

Each inflorescence has 35 to 40 flowers, all with the potential for producing seed. Field observations revealed 1–14 pods per inflorescence on four plants examined with five pods per inflorescence being the most common (fig.1). Ten ovaries were examined and found to contain four ovules each. Forster (1990) observed 1–4 seeds per capsule from a sample of 146 pods with 85 percent of the capsules containing one or two seeds and only 1 percent of the capsules containing four seeds.

The fruit forms in November and December and, soon after maturing, splits to release the seeds. Whether the opening of the capsule forcibly ejects the seed or whether the seed just falls to the ground is not known. Field observations indicated much seed remains under the parent plant. Forster (1990) observed that due to the viscid nature of the pods, several pods with associated seeds adhere into a single unit. Gravity and wind, up to 3m, then disperse this unit.

Seeds have a small white aril. It is suggested that such aril developments promote secondary dispersal by ants (Berg 1975).

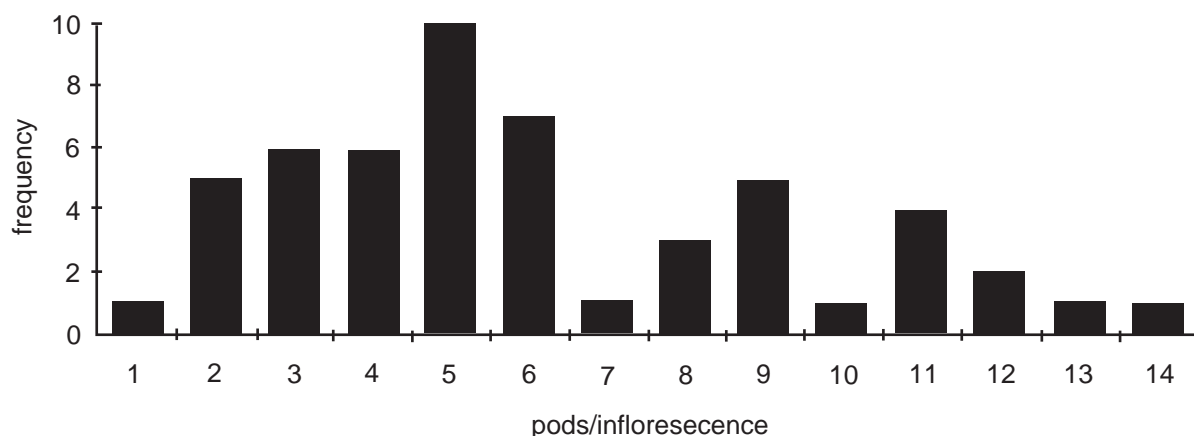
Figure 1. Number of pods/inflorescence on *A. porcata* shrubs observed in September 1992.

Table 4. Number of seeds/pod for sample of pods.

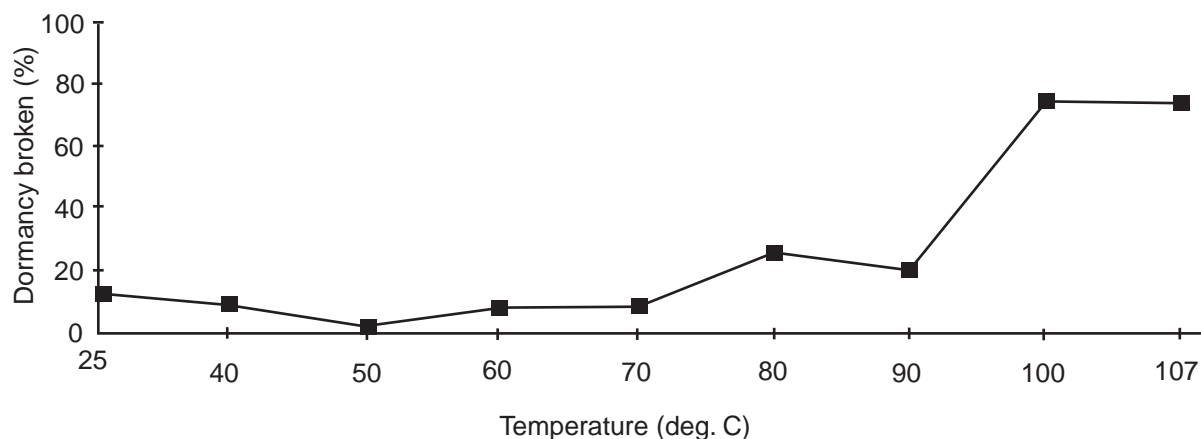
Sample number of pods with number of seeds	1	2	3	4	5	6	B	Cc	E	Total
1	192	10	123	156	71	108	55	71	19	41%
2	178	30	114	115	41	108	45	56	16	36%
3	62	8	43	22	14	36	27	31	8	13%
4	16	2	3	32	0	8	13	2	1	2%
0	68	10	6	6	4	26	10	5	11	9%

Some predispersal seed predation was observed in the field, presumably due to insect larvae.

Seeds are released from the fruit largely in a dormant state. Trials indicate the non-dormant seed fraction is low (about 13%). The dormant portion of the annual seed production would accumulate in the soil as a persistent seedbank. The length of seed viability in the soil is unknown. Seeds have been germinated successfully three years after collection off the plant.

Preliminary investigations showed that as with many other legume seeds the dormancy, which is caused by an impermeable seed coat, is broken by heat. The response to a range of temperatures showed that seed dormancy was broken by temperatures around 100°C and 107°C (fig.2). This suggests fires that cause significant soil heating are likely to break the seed dormancy of *A. porcata* while fires of low intensity would have little effect on the germination of seeds. Further work has shown 100 percent germination following the scarification of the seed coat with a scalpel.

Figure 2. Effect of heat on the seed dormancy of *A. porcata*.



## Genetic distinctiveness

Isozyme work indicates very high levels of polymorphic loci, especially compared with other *Acacia* species. Gene diversity within the populations was fairly consistent, ranging from 0.426 to 0.521, with the average number of alleles per locus ranging from 2.3 to 2.5. All populations showed an excess of heterozygotes.

Genetic diversity measures between the populations indicate very little population differentiation. The genetic work indicates that the levels of allelic diversity are high when compared with other species. Excess of heterozygotes also indicates inbreeding is not occurring. Many rare and endangered species in isolated situations similar to *A. porcata* exhibit high levels of inbreeding. The current data suggests inbreeding might not be a threat to the population. However, further work will be carried out to determine if any mechanisms are occurring which results in the selection of heterozygotes.

Preliminary cytological studies have been carried out and have found that the basic chromosome number of  $2n = 26$  for *A. porcata*. The diploid complement of 26 is the most common chromosome number reported for *Acacia* (Darlington and Wylie 1955; Fedorov 1974 & Hamant *et al.* 1975).

## 2.5 Reasons for listing

The present conservation listing of 'endangered' for *A. porcata* is considered appropriate and should be maintained for the present. *A. porcata* has a small number of individuals (1177) in nine populations with a geographic range of approximately 6km. The populations are in an area that lacks long-term habitat security.

With knowledge of the species limited, the stability of *A. porcata* populations and possible threats to their long-term existence in the wild are difficult to determine. Evidence does not suggest the species has declined due to habitat loss or fragmentation. However, if causal factors continue to operate, *A. porcata* is considered unlikely to survive in the wild in the long term.

Little is known about the fire ecology of *A. porcata*. However, an inappropriate fire regime could be the single most important threat to the continued existence of this species in the wild. The lack of secure land tenure is a threat to the long-term viability of the species in the wild.

## 2.6 Existing conservation measures

Under the *Nature Conservation Act 1992* it is an offence to, or to attempt to gather, pluck, cut, pull up, destroy, dig up, fell, remove or injure a protected plant or any part of a protected plant, other than under those exceptions listed under sections 62 (1) and 89 (1).

### 3 Recovery objectives and criteria

The ultimate objectives of the recovery plan are to ensure the habitat of *A. porcata* is secure from any threats to the population's viability, and to maintain sustainable population levels in the wild in the long term. These objectives are considered achievable within 15 years of implementing this plan and would allow the re-listing of the species from 'endangered' to 'vulnerable'.

#### 3.1 Recovery objectives

- Improve the conservation status of *A. porcata* from 'endangered' to 'vulnerable' (ANZECC) within 10 years
- Investigate the ecology and genetics of the species to enable decisions about management
- Achieve controlled cultivation of *A. porcata*

#### 3.2 Recovery criteria

- Obtain an understanding of the population dynamics, reproductive biology and genetic diversity of *A. porcata*
- Establish the role of fire in the ecology of the species
- Maintain and increase existing population levels of *A. porcata* in the wild
- Obtain environmental protection for populations

#### 3.3 Recovery actions

**Action 1** Undertake further surveys to try to locate new populations

**Action 2** Provide secure habitat by negotiating a conservation agreement with the lessee and managing authority

**Action 3** Monitoring population levels for the purpose of detecting any detrimental effects of management (This can be carried out as part of Action 4.1.)

**Action 4** Undertake ecological and biological investigations:

**4.1** Investigate the population dynamics and reproductive biology of the species by permanently tagging individuals and monitoring their life history

**4.2** Investigate the genetic diversity of *A. porcata*

**4.3** Investigate aspects of seed biology with attention to the seedbank dynamics

**4.4** Investigate the role of fire in the ecology of *A. porcata*

**Action 5** Undertake controlled cultivation and propagation ensuring the representative sampling of the genetic diversity of the species. Depending on outcomes from Action 4, consider appropriate reintroduction or translocation of individuals to suitable sites.

##### Action 1

Traverses have been undertaken across much of the area surrounding the known populations of *A. porcata* with no additional populations found. Modelling to locate potential sites will be undertaken and field checked. This work will be completed in 1999. A recovery team comprising regional QPWS extension staff, Queensland Herbarium, and research personnel has been established. Due to the remoteness of the site, community involvement and interest is still being sought. Community involvement is more likely once the details from Action 4 are better understood.

##### Action 2

Protection of the habitat can be achieved by land acquisition or by negotiating a conservation agreement under the *Nature Conservation Act 1992*. At present a conservation agreement is considered appropriate for the protection of *A. porcata*.

Negotiations between the lessee and the Queensland Parks and Wildlife Service should be undertaken to seek an agreement to protect the habitat of the species in the long term. The Queensland Parks and Wildlife Service's Southern Regional Office will be responsible for this action.

##### Action 3

All known plants have been tagged. A representative number of plants should be observed to check for long-term survival. Monitoring is required to determine whether the population is stable, increasing or decreasing and to assess the effectiveness of any actions taken. A census is taken each April, in conjunction with searches for new plants. This should be continued. Two field officers could undertake this work one week a year.

##### Action 4

With such a small population, any decline in numbers or genetic diversity should be minimised. To achieve this, future management must be able to predict what will happen to populations under certain conditions. Such a prediction presupposes knowledge about the life history of the species. Targeting the lack of biological data is a priority that should be undertaken in the recovery process of *A. porcata*. Research into the biology of the species should focus on:

- fire ecology — the effects of varying fire regimes on germination and recruitment
- seed biology — dispersal, predation, and seedbank dynamics
- life history — age required to produce seed, lifespan of individuals
- reproductive biology and genetic diversity — breeding system and its effect on genetic diversity

Current funding is supporting research into the biology and genetics of the species. This work has been undertaken, supported by funding from the Natural Heritage Trust. The final report will be complete in 2000.

**4.1** Investigate the population dynamics and reproductive biology of the species.

Permanently tag individuals and monitor their life history. Investigate pollination viability, and if possible identify pollination vectors.

**4.2** Investigate the genetic diversity of *A. porcata*

Undertake isozyme analysis to determine the genetic variability of the population. Confirm number of chromosomes.

**4.3** Investigate aspects of seed biology with attention to the seedbank dynamics.

Collect seed to determine dormancy and viability under various conditions. Determine the composition of existing seedbanks.

**4.4** Investigate the role of fire in the ecology of *A. porcata*  
Collate fire history for sample sites using air photography and local knowledge. Look for correlation between fire events and germination events. Site 3 was burnt in spring 1998. Monitor this site for seedling germination and establishment. Investigate the option of control burning a portion of site 6, and monitoring germination and seedling establishment.

##### Action 5

Botanical gardens are being approached to further this action. Information to date suggests the species may be newly evolving. If this is the case, appropriate mechanisms need to be considered to enable its establishment. Methodologies as to how to achieve this action will need to be investigated. Alternatively, if the current site is the last stronghold of the species, translocation and/or introduction of individuals will be undertaken.

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### 3.4 Implementation schedule

Action	Task description	Priority	Feasibility %	Costs	Responsible party	Timeframe
1	Survey for additional populations	1	100	6000	QPWS	Completed Dec 2000
2	Provide secure habitat	1	100	unknown	QPWS	Negotiations ongoing
3	Monitor populations	1	100	9900	QPWS	Ongoing
4	Biological studies	1	100	9900	QPWS	Completed Dec 2000
5	Controlled conservation	2	100	500	EPA	Completed Dec 2001

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## 4 Acknowledgements

Information and advice to help prepare this report was kindly provided by: Mr P.I.Forster, Queensland Herbarium, and Mr and Mrs L.Newton, Manyung. Assistance in the field was kindly provided by P.I.Forster, P.R.Sharpe, R.Neihus, D.P.Robins, C.Appelman, M.McGowan (Louden), D.Sharpe, F.Leverington and W.Harris. Constructive comments on an early draft of this report were kindly provided by Ms M.Thomas. Significant assistance with the understanding of genetic data, and fieldwork was provided by Dr J.Playford. The Endangered Species Unit of Environment Australia provided funding for the report's preparation. The Environmental Protection Agency and the Queensland Parks and Wildlife Service provided administrative and technical support for the project.

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