Threatened plant translocation case study:

Acanthocladium dockeri (Spiny Daisy), Compositae

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The Species

- Small upright spreading shrub.
- Clonal.
- Six extant natural populations within a 110 km range in South Australia's mid-North region.

Figure 1. *Acanthocladium dockeri* leaves, flowers and spines. Photo: E. Rees

Threatening Processes

- Weed competition.
- Low genetic diversity.
- Road and roadside maintenance.
- Herbivores – exotic snails, rabbits, hares, kangaroos.
- Agricultural chemical drift.

Deciding to translocate

Twenty years ago, *Acanthocladium dockeri* was known from only two historic records: Menindee Lakes, NSW (1860), and Overland Corner, Murray River, SA (1910). After failed attempts in the 1990s to locate the species, it was considered to be extinct, until a population was discovered in 1999 near Laura (SA), 210 km NW of Overland Corner.

Figure 2a. Exotic snails on an *Acanthocladium dockeri* stem; 2b. Grader damage. Photos: M. Jusaitis

Another five populations were subsequently discovered, within 70km of Laura, all on roadsides and adjacent agricultural land. Most were in degraded, weedy habitats. Given the limited area of occupancy, fragmented habitat and inferred decline, the species was listed as Critically Endangered under the *EPBC Act*.

All populations are clonal, reproducing vegetatively. Seed viability is very low, and propagation attempts using seed have failed. Given the difficulty and effort in managing threats at the remnant sites, translocations were attempted between 2000-2010, within its extant range,

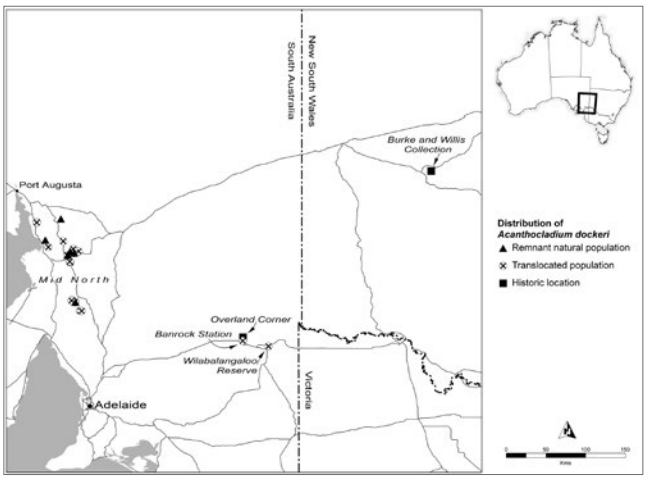

Figure 3. *Acanthocladium dockeri* distribution.

as either augmentations of remnant populations, new back-up populations or education sites. These met with mixed results due to soil type, aspect, snails, follow-up maintenance or rainfall.

Despite these translocations, the number of populations and extent of occurrence remained small; many sites were without secure tenure and threatened by disturbance, especially remnant sites. In 2013 the Recovery Team decided to search for suitable translocation sites in the vicinity of Overland Corner.

Aim of the translocation

- Establish three self-sustaining subpopulations of mixed genotype *A. dockeri*.
- Increase the species' extent of occurrence.
- Engage the community in the translocation process and increase awareness of the Spiny Daisy Recovery Project through partnership with Banrock Station.

Translocation working group and key stakeholders

- Spiny Daisy Recovery Team.
- Accolade Wines (Banrock Station).
- Trees For Life Inc.
- Natural Resources South Australian Murray Darling Basin (NR SAMDB).
- Natural Resources Northern and Yorke.
- Department of Environment, Water and Natural Resources (DEWNR).

Biology and Ecology

- Seed production and seed viability are very low.
- Appears to only spread vegetatively, by root suckers.
- All natural populations are clonal, but each is genetically distinct.
- Re-establishes quickly after fire.
- Variable soils – sandy to sandy loam, but also clay loam.
- 220 – 450 mm annual rainfall.
- Remnant grasslands or low shrub-lands on low hills and plains. Historically from low sand hills on river flood plains.

Site selection

Department of Environment, Water and Natural Resources (DEWNR) and Natural Resources SA Murray-Darling Basin (NR SAMDB) ecologists surveyed the area for sites with suitable soils and rainfall, minimal threats and security of tenure. Banrock Station was selected for its secure tenure (i.e., a Ramsar Wetland), management with a proven commitment to conservation, and capacity to manage the sites long-term. The threats are absent or minimal and easily managed. The habitat is healthy, stable and similar to that of Overland Corner (only 4 km away). Two ecologists are employed full-time to manage the wetland, with a nursery for propagation and available water for seedling establishment.

Three sites of suitable habitat were chosen on land with gentle slopes and minimal public access.

Translocation proposal

A Translocation Proposal was written in accordance with ANPC Guidelines (Vallee *et al.* 2004), and approved by the Spiny Daisy Recovery Team. A Memorandum of Understanding was agreed upon by Accolade Wines and DEWNR, to cover the translocation project and the on-going support and maintenance.

Pre-translocation preparation

In total, 1759 cuttings were collected from the six remnant populations in spring 2013, and propagated at the Banrock Station nursery. Cuttings were dipped in rooting hormone and potted into trays with a mix of peat moss, vermiculite and pearlite. When cuttings were large enough they were transferred to 90 mm tubes to develop larger root systems. By winter 2014, 940 individuals had been propagated, of which about 800 were suitable for planting out.

One week prior to planting, the translocation sites were rotary-hoed to 20 cm depth. This tillage destroyed the major weeds e.g., onion weed (*Asphodelus fistulosus*), and no other immediate weed control was necessary.

Design and implementation

The plan was to plant 30 individuals sourced from each of the six remnant populations, at each translocation site (90 plants/clone; 540 plants total). However, insufficient plants were available from two clones at the time of planting. Consequently, 396 individuals were planted in July 2014, comprising 90 each from four clones and 36 from a fifth.

Individuals were planted 50 cm apart, in rows 1 – 1.5 m apart. Each clone was planted as a group, and native species were planted between the clone groupings. Rows were named and tagged. Plants were watered by dripper lines, each site supplied with a polytank and timer. Corflute guards were placed around the plants, and a rabbit-proof fence was constructed around each site.

Figure 4. Planting *Acanthocladium dockeri*, June 2014. Photo: C. Tourenq

Ongoing maintenance

The plants were watered after planting, then thrice weekly in the first summer. Weeds were controlled using minimal disturbance techniques. Baiting was used to control introduced snails as required. Guards were removed when they started restricting plant growth.

Subsequent actions

In spring 2015, additional cuttings were collected from the fifth and sixth populations for propagation. This enabled a second planting in July 2016 of 39 and 37 plants respectively, dispersed evenly across the three sites. A further trial in a flood-prone site with more clay content on the wetland margins was attempted but failed.

Growth, survivorship and establishment were monitored quarterly in year 1, biannually in years 2-3, and annually thereafter, recording:

- Survival of translocated individuals.
- Number of ramets per individual.
- Growth of plants and ramets as per Clarke and Haase (2012) i.e., height, width and perpendicular width.
- Presence and abundance of flowers and fruits.

The monitoring methods will change in 2018 as it becomes increasingly difficult to determine each new ramet's source plant. The new method will measure percentage coverage of *Acanthocladium dockeri* within a 1 m^2 quadrat placed around each original plant.

Outcomes

- The survival rate was 94.4% (year 1), 89.1% (year 2) and 87.2% (year 3).
- The best survivorship (93.3%) and the most prolific ramet production at all sites was displayed by Melrose clone plants.
- The 'Native Jasmine' site has had the best survivorship across all genotypes (86%), and the plants at this site have produced the most ramets (1,859).
- The least successful plants were sourced from Yangya.
- No flowers have produced a viable fruit.
- This summary of outcomes was provided by T. Field (pers. comm., February 2018).

What we learnt

- *Acanthocladium dockeri* benefits greatly from soil disturbance. Soil tillage prior to planting allowed plants to thrive and spread more quickly.
- Regular watering through the first summer greatly improved plant survivorship.
- The extra attention provided by the on-site ecologists was invaluable.
- *Acanthocladium dockeri* survives in clay soils, but prefers open sandier soils.

Figure 5. Banrock's Native Jasmine site before and after; a) June 2014, b) February 2018. Photos: D. Bickerton and T. Field

- Kangaroos browse ramets, but less so older plants. Their impact is substantially less than that of rabbits or snails.
- The prospect of a good conservation story attracted a corporate partner, ensuring media attention and improving community engagement.

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Threatened plant translocation case study:

Caladenia hastata (Nicholls) Rupp (Melbloms Spider-orchid), Orchidaceae: Pollinator rarity limits conservation translocation sites in a rare orchid

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The Species

Caladenia (Figure 1) is a diverse genus, with over 350 species recognised in Australia (Phillips *et al.* 2009). *Caladenia* are deciduous terrestrial orchids that die back annually to small, spherical subterranean tubers that are protected by a tough, fibrous tunic. *Caladenia hastata* (Melbloms Spider-orchid) has a single green, linear-lanceolate, sheathing, basal leaf, which is approximately 15 cm long, 10 mm wide and conspicuously hairy (Todd 1999). Plants flower for approximately four weeks each year between late September and late November. Flowering scapes grow to 30 cm in height, bearing one or rarely two, cream-coloured flowers approximately 80 mm in width. The petals are 25- 45 mm in length with dark red osmophores that exhibit a characteristic club-like swelling. The labellum has a strongly recurved apex.

Previously widespread across western Victoria and adjacent parts of South Australia (Hill *et al.* 1999), *C. hastata* is currently known from only five small populations (four natural and one failed relocation) and is highly vulnerable to extinction from a range of threats. The current number of known mature individuals is only 379, with the majority of these individuals occurring at only two populations. The remaining three populations support only one or two individuals. *Caladenia hastata* is listed as:

- Endangered under the DELWP Advisory List of Rare and Threatened Plants.
- Threatened under the Victorian *Flora and Fauna Guarantee Act 1988*.