Experimental translocation of the endangered pearl-like *Androcalva* in south-west Western Australia

Shane R. Turner[1], Eric Bunn [2] & Carole P. Elliott[3]

[1] - Research Scientist, Kings Park Science; Department of Biodiversity, Conservation and Attractions, Kings Park, WA 6005, Australia shane.turner@dbca.wa.gov.au

[2] - Research Scientist, Kings Park Science; Department of Biodiversity, Conservation and Attractions, Kings Park, WA 6005, Australia eric.bunn@dbca.wa.gov.au

[3] - Research Scientist, Kings Park Science; Department of Biodiversity, Conservation and Attractions, Kings Park, WA 6005, Australia carole.elliott@dbca.wa.gov.au

Introduction

Androcalva perlaria (Malvaceae) is protected under the Biodiversity Conservation Act 2016 as the species was gazetted as Declared Rare Flora (DRF) in January 2008. It is officially ranked as Endangered (EN) based on The International Union for Conservation of Nature (IUCN, 2001) criterion C2a(i) due to less than 400 individuals remaining across six populations (Whiteley *et al.,* 2016). This species was first collected by botanists from the south coast of Western Australia in 1993. A second collection was made in September 2005 during mine survey work less than 40 km from the type location. *Androcalva perlaria* occurs over a very short range (~1,600 km^2), on sandy-clay soils in seasonally-waterlogged sites around the small wheatbelt town of Wellstead, approximately 100 km east of Albany, Western Australia. Over 80% of the vegetation around Wellstead has been cleared for agriculture and most populations are found in bushland fragments on farmland. However, one of the largest populations is found in a roadside reserve. The second largest population occurs within a proposed mine site. *Androcalva perlaria* is not currently listed under the Australian Government Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).

Small *Androcalva perlaria* plant *in situ* © S. Turner

Goals

- Assess plant performance across two different translocation sites.
- Determine whether differences in plant performance are based on the use of different propagation material (seeds or cuttings).

- Understand if the use of an anti-stress agent (aspirin) and a slow release native fertilizer improves plant performance and survival.
- Gain a better understanding of the factors affecting translocation success and provide a more insightful site assessment process.

Success Indicators

- *Initial success of plantings (after one year):* Survival of at least 75% beyond their first summer when planted into sites currently supporting natural *A. perlaria* populations.
- *Medium term success of plantings (after two years):* Survival of at least 50% beyond their second summer when planted into sites currently supporting natural *A. perlaria* populations.
- Translocated plants behave physiologically in a similar way as naturally occurring plants when assessed in different seasons.

Project Summary

Feasibility:

Habitat: Androcalva perlaria occurs on sandy-clay in seasonally-waterlogged sites adjacent to *Eucalyptus occidentalis* wetlands, growing with *Anarthria laevis, Acacia cyclops*, *Actinodium calocephalum* and *Patersonia occidentalis*. Due to extensive clearing and other impacts, site selection was a significant challenge. After extensive review, two sites were deemed potentially suitable: 1) large wetland reserve (Mettler Lake Nature Reserve) that appeared similar to natural *A. perlaria* habitat, and 2) site where *A. perlaria* already naturally occurred. The second site was a proposed minesite to act as a control, as natural *A. perlaria* plants within this population were very healthy, and there were no signs of diseases, pests, or grazing.

Species: Androcalva perlaria is a quick growing seeder shrub that is readily propagated via the use of seeds, cuttings, and tissue culture (Nikabadi *et al.*, 2010; Whiteley *et al.,* 2016). It is low spreading and grows 0.5 m high by 1 m wide. Flowers are light cream and observed between September & December. The fruit is green-grey with a velvety hairy covering (Wilkins & Whitlock, 2011). Plants produce large numbers of small black physically dormant seeds, which form a persistent long-lived soil seed bank that is stimulated to germinate in response to fire (Turner *et al.,* 2013). Seedlings reach reproductive maturity within 12 months of germination.

Socio-political & economic: The implementation of the translocation was viewed as unlikely to cause significant adverse social and economic impacts as both of the sites selected for the translocation were either a Class A nature reserve with secure long-term conservation tenure or on a proposed mine site which had already been approved to be cleared thus the nature for undertaking the translocation was for research outcomes rather than purely for conservation purposes (Department of Parks and Wildlife, 2014).

Planting underway at Meter site © C. Elliott

Implementation:

Translocation: The site at Mettler Lake Nature Reserve (~400 ha) had been burnt several years prior and was also fenced to exclude herbivores. The translocation site (~50 x 50 m) was located on the western side of the wetland and situated on the side of a gently sloping ridge within seasonally waterlogged wetlands. The site selected on the proposed mine was a similar size but left unfenced (no herbivore activity). This site was also open with relatively sparse overstory and understory present. Tubestock (derived from cuttings and seed) were produced six months before field installation in July 2014. Within each site, 80 plants were randomly placed in lines 1 m apart, numbered then measured, with a subset also receiving fertilizer and/or an anti-stress agent (aspirin solution).

Cultural/tribal: Indigenous communities interested or involved in the region affected by this plan have not yet been identified. The Aboriginal Sites Register maintained by the Department of Indigenous Affairs does not list any significant sites in the vicinity of both translocation sites. However, not all significant sites are listed on the Register (Department of Parks and Wildlife, 2014).

Trans-border: Not applicable.

Veterinary/phytosanitary: Re-introduced plants were propagated using standard horticultural hygiene practices and grown in an accredited nursery (Kings Park and Botanic Garden Nursery) prior to field planting.

Post-planting monitoring:

Monitoring regime: Monitoring was undertaken after the first month and then every six months for the first year and then annually thereafter. Data collected included recording the number and health (1 to 5 rating system) of surviving plants, height, plant width, and reproductive state. Other metrics recorded included soil temperature and moisture, soil physical attributes, soil chemical attributes and details of the vegetation communities present. To understand a little better the physiological attributes of the translocated plants LiCOR (Photosynthesis, stomatal conductance and transpiration) and pressure bomb (predawn and midday water potential) measurements were undertaken and compared with measurements recorded for naturally occurring plants. These were collected during mid-summer (dry season) and mid-winter (wet season). These

data were used to provide a comprehensive snapshot of all the similarities and differences across both translocation sites in terms of plant performance and site attributes.

Proposed minesite natural habitat © S. Turner

Results: After two years of establishment plants at the proposed minesite had performed much better in terms of overall survival (91.3 ± 3.1%), plant health (4.5 ± 0.6) and growth (100 ± 39 cm wide) compared to the Mettler site where plants performed much more poorly i.e. lower survival (41.3 ± 11.8%), poorer plant health (2.8 ± 0.5) and smaller plants (33 ± 14 cm wide). Within both sites consistent and significant treatments effects were noted such as better performance of seed produced plants and fertilizer also modestly improving some plant attributes. Physiological measurements found that plants at the Mettler site were under significantly more water stress during summer and their photosynthetic capacity was also much lower. Translocated plants on the proposed minesite were overall physiologically similar to naturally occurring plants during winter as well as summer.

Major difficulties faced

- Locating suitable habitat that may support translocation of the species.
- Creating *in situ* planting spots among compacted soil with numerous existing plant roots.
- Logistics of obtaining physiological measures of plants (i.e. predawn water potential measurements) due to remoteness.
- Negotiations among stakeholders to agree to the translocation proposal and experimental approach within a suitable time frame.

Major lessons learned

- Holistic habitat assessment greatly improves translocation site selection.
- Good site selection is critical for high survival and growth.
- Plants produced from seeds performed better than those produced from cuttings.
- Results of aspirin treatment as an anti-stress agent were inconclusive with no significant benefit in terms of plant performance determined.
- The use of soil probes to monitor moisture and temperature and quantification of basic soil attributes provided standardized baselines for

comparisons between sites.

Success of project

Highly Successful	Successful	Partially Successful	Failure

Reason(s) for success:

- Higher survival was due to increased soil moisture at the natural *A. perlaria* population site, compared to the wetland reserve site which was generally much drier.
- The wetland reserve site did not exactly match the natural *A. perlaria* sites, with minor differences in vegetation structure and some soil attributes noted.
- Sustained adequate investment in research provided key information for obtaining high plant establishment through using an experimental framework that identified key factors that regulate translocation success.

References

Department of Parks and Wildlife (2014) Pearl-like androcalva (*Androcalva perlaria* C.F.Wilkins) Interim Recovery Plan 2014 - 2019. Interim Recovery Plan No. 341. Department of Parks and Wildlife, Western Australia.

Nikabadi, S., Bunn, E., Turner, S., Stevens, J. & Dixon, K. (2010) Development of an *in vitro* propagation protocol for *ex situ* conservation of two critically endangered species of *Commersonia* (Malvaceae) from Western Australia. *Australian Journal of Botany* 58: 565-574.

Turner, S., Best, C. & Barrett, S. (2013) Combining science with management: Understanding the seed ecology of 'Pearl-like Androcalva' underpins successful *in situ* regeneration by fire of this threatened species. Australasian Plant Conservation 22: 19-21.

Whiteley, S.E., Bunn, E., Menon, A., Mancera, R.L. & Turner, S.R. (2016) *Ex situ* conservation of the endangered species *Androcalva perlaria* (Malvaceae) by micropropagation and cryopreservation. Plant Cell Tissue and Organ Culture 125: 341-352.

Wilkins, C.F. & Whitlock, B.A. (2011) A new Australian genus, *Androcalva*, separated from *Commersonia* (Malvaceae s.l. or Byttneriaceae). Australian Systematic Botany 24: 284-349.

Global conservation translocation perspectives: 2021

Case studies from around the globe

Edited by Pritpal S. Soorae





IUCN SSC Conservation Translocation Specialist Group

Conservation Translocation SPECIALIST GROUP

SSC Species Survival Commission

هيئة البيئة - أبوظبي Environment Agency - ABU DHABI

calgaryzoo

Wildlife Reserves Singapore Group

THE ASPINALL FOUNDATION