The Wheatbelt Orchid Rescue Project: Helping Endangered Orchids by Working With Community Groups

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The Wheatbelt Orchid Rescue (WOR) project is a Lotterywest funded collaboration between the School of Plant Biology at the University of Western Australia, the West Australian Native Orchid Study and Conservation Group (WANOSCG), the Department of Environment and Conservation (DEC) and the Friends of Kings Park (FoKP). This project is helping to conserve endangered orchids in the wheatbelt by obtaining knowledge required for sustainable management and directly contributing to recovery actions. The WOR project also aims to promote collaboration between community groups, government agencies and universities, and to raise public awareness of threats to biodiversity in Western Australia. Five species of Declared Rare Flora are the main focus of the WOR project (Figs 1-5); the granite spider, ballerina, william's spider, lonely hammer and underground orchids *(Caladenia graniticola, C. melanema, C. williamsiae, Drakaea isolata* and *Rhizanthella gardneri*). Key threats to these orchids include very small habitat areas, small populations and salinity.

A major objective of the WOR project was to harness the expertise of WANOSCG members to help locate and count rare orchids in potential habitat areas. In 2008 the WOR project organized a 3-day survey of potential habitat area for the granite spider orchid in the vicinity of Dragon Rocks Nature Reserve (Fig. 6). Despite the fact that very few of these plants had been found locally in previous years, over 300 plants were found during the WOR survey, increasing the local known population estimate tenfold. A new subpopulation was also discovered and a total of 42 orchid species were seen in the area.

Other rare orchid surveys by WOR, DEC and WANOSCG counted individuals for the lonely hammer orchid in 2007 and the underground orchid in 2007 and 2008. There also were comprehensive surveys of the william's spider and ballerina orchid in 2010 by the author, Kris Brooks (DEC Flora Conservation Officer), volunteers from WANOSCG (Margaret Petrides, Pam Goodman) and representatives of wheatbelt community groups (Jocelyn Ward from Nyabing and Lucy Skipsey from Pingrup) (Fig. 7). These surveys resulted in updated counts of individuals and location data used to map critical habitat areas to allow more effective management and monitoring of these rare orchids in the future. Orchid habitat mapping was also used to develop a new nature reserve proposal for an area along the Oldfield River near Munglinup. Another key outcome has been the discovery of two new populations of the ballerina orchid south of Lake Grace by Margaret Petrides, a WANOSCG member.

The WOR project measured vital statistics for each rare orchid annually by counting emergent orchids, seed set, pollination and grazed plants along a 50 m transect. As shown in Figure 8, the number of orchids that emerged and flowered varied substantially from year to year, as did rates of pollination (0-85%) and grazing (5-50%). Transect data shows that for the ballerina orchid there was a substantial increase in numbers from 2007 to 2009 (Fig. 8). However, it is difficult to estimate population sizes for orchids since some plants remain dormant each year, especially when there is severe drought.

Orchid seeds are only about 0.2 mm long (called dust seeds) and require a fungus for germination. Around 200 seed samples were collected of rare and common orchids in the same habitats using seed bags to protect developing capsules. Orchid seed baiting using soil from field sites was used to identify potential new habitats for orchids within new or existing locations (Fig. 9).

A new method of non-sterile symbiotic seed germination was developed based on the seed baiting method by using soil organic matter containing symbiotic fungi (Fig. 10). Seeds were sown in permeable packets and incubated in the dark. A second new development in orchid propagation was developed that uses permeable pouches to protect and track growth of very small orchid seedlings. Young protocorms (seedlings) transplanted into these pouches were grown in potting mix inoculated with mycorrhizal fungus under lights in an incubator (Fig. 11). Emily Ager, a 4th year UWA student, compared growth rates from the different propagation methods by measuring protocorms weekly. Results show a high variation between species for each propagation method, but the asymbiotic media (sterile agar with mineral salts, sugar and organic supplements) was much slower and more erratic than other methods overall. Non-sterile symbiotic germination in seed packets was the most time and cost efficient method in these trials and resulted in hundreds of large seedlings for translocation trials. Window pots were used to measure seedling growth tuber formation in the glasshouse (Fig. 12). Permeable translocation pouches were found to protect growing seedlings in the field and glasshouse. Further work is required to optimize methods for seedling production and translocation.

For the past 2 years the FoKP Orchid Carers Group have played a key role in propagating rare orchids for the WOR project (Fig. 13). The Orchid Carers (Lyn Rowland, Lyn Roberts, Val Preston, Phylis Robertson and Mary-Ann Andrews) attended regular propagation sessions at the University of Western Australia. They were involved in seed cleaning, pricking out seedlings from germination media into growing pouches, preparing potting mix and preparing pots for the growth of larger seedlings. It is anticipated that some of the techniques learned, especially new techniques for the establishment of propagated seedlings into potting mix, will be of benefit during future work at Kings Park. The orchid carers also helped to translocate rare orchid seedlings into nature reserves in the wheatbelt in 2010.

In 2009 and 2010, seedlings of the granite spider orchid and 4 other species were transplanted to 3 remote locations in the central and eastern wheatbelt, necessitating a round trip of approximately 1000 km (Fig. 14). There was a very low survival rate of orchid seedlings, but a few orchids survived despite record-breaking drought conditions. It is hoped that there will be future opportunities to further optimize translocation protocols for orchids and measure the long-term survival of these new orchid populations.

At the end of this four-year project a number of conclusions are evident:

1. Surveys of rare orchids are much more efficient and successful with a team of enthusiastic and experienced volunteers such as WANOSCG members.
2. The Friends of King Park Orchid Carers group provided enthusiastic and efficient support for both laboratory and field work with rare orchids and have the knowledge and experience to contribute to future orchid rescue programs.
3. The WOR project increased community group involvement in orchid conservation and both for rural residents who live near rare orchids and those who travelled from cities to attend rare orchid surveys.
4. Increasing public awareness and community group involvement in the wheatbelt has resulted in the discovery of new populations of rare orchids.
5. Vital statistics data must be gathered from the same plots over subsequent years to overcome problems with dormancy, especially in dry years.
6. Propagation of native orchids is possible using relatively fast, simple and inexpensive non-sterile methods without the need for complex laboratory facilities. These improved methods for propagating orchids allowed them to be established into soil when they are only a few months old.
7. Translocation of propagated orchids into wheatbelt nature reserves is possible, but was greatly hampered by drought conditions, especially in 2010.

8. Location of the project at a university provided essential resources as well as support from students undertaking research projects.

I would particularly like to thank Lotterywest for supporting this project. This work would not have been possible without the enthusiastic support of survey volunteers from WANOSCG who travelled to remote locations to attend surveys as well as our wheatbelt helpers. I would also like to especially thank Ann and Barry Rick (Newdegate) and Judy Williams (Brookton), DEC staff (Andrew Brown, Kris Brooks, Marie Edgley and Erica Shedley) and the FoKP Orchid Carers Group for their help conserve our iconic orchid species. Final reports for this project are currently being prepared for online publication and can also be obtained from the author (mark.brundrett@uwa.edu.au).

Captions

Figure 1. The granite spider orchid *Caladenia graniticola* grows near granite rocks in the south-eastern wheatbelt.

Figure 2. The William's spider orchid (*Caladenia williamsiae)* occurs in a single nature reserve.

Figure 3. The ballerina orchid (*Caladenia melanema)* with suspected pollinator.

Figure 4. The western underground orchid (*Rhizanthella gardneri).*

Figure 5. The lonely hammer orchid (*Drakaea isolata*). The entire habitat area for this orchid (some 10 ha) has a very high salinity risk.

Figure 6. Volunteers from the West Australian Native Orchid Study and Conservation Group at Dragon Rocks Nature Reserve after 3 days of searching for rare orchids.

Figure 7. A survey of known habitats of the ballerina orchid in 2010 (Kris Brooks, Margaret Petrides and Jocelyn Ward).

Figure 8. Vital statistics for the ballerina orchid show annual variations in emergence, flowering, seed set and grazing by animals along a 50 m transect. Seed set was severely reduced by grazing and drought.

Figure 9. Orchid seed baiting detects fungi that germinate seedlings in soil from natural habitats. These tiny protocorms (seedlings) of the ballerina orchid are about 1/2 mm long.

Figure 10. Seedlings of the granite spider orchid grew most rapidly in a non-sterile system harnessing fungi contained in organic matter from their natural habitat.

Figure 11. Older granite orchid seedlings growing in transparent pouches.

Figure 12. Window pots developed for the WOR project allowed seedling growth and tuber formation to be measured.

Figure 13. The Friends of Kings Park Orchid Carers Group propagating rare orchids for translocation (Phylis Robertson, Val Preston, Lyn Roberts and Lyn Rowland).

Figure 14. Translocation trials were established in 3 nature reserves in the wheatbelt by the WOR project in 2009 and 2010 (Nur Koshkuson a volunteer and Emily Ager a former student of the University of Western Australia).