



Global Re-introduction Perspectives: 2010

Additional case-studies from around the globe
Edited by Pritpal S. Soorae



IUCN/SSC Re-introduction Specialist Group (RSG)





The designation of geographical entities in this book, and the presentation of the material, do not imply the expression of any opinion whatsoever on the part of IUCN or any of the funding organizations concerning the legal status of any country, territory, or area, or of its authorities, or concerning the delimitation of its frontiers or boundaries.

The views expressed in this publication do not necessarily reflect those of IUCN.

Published by: IUCN/SSC Re-introduction Specialist Group & Environment Agency-ABU DHABI

Copyright: 2010 International Union for the Conservation of Nature and Natural Resources.

Citation: Soorae, P. S. (ed.) (2010) GLOBAL RE-INTRODUCTION PERSPECTIVES: Additional case-studies from around the globe. IUCN/SSC Re-introduction Specialist Group, Abu Dhabi, UAE, xii + 352 pp.

ISBN: 978-2-8317-1320-5

Cover photo: Clockwise starting from top-left:
i. Damselfly, UK © *PC Watts*
ii. Corn crane, UK © *Andy Hay (rspb-images.com)*
iii. Western prairie fringed orchid, USA © *Margaret From*
iv. Arabian oryx, Saudi Arabia © *M. Z. Islam*
v. Corroboree frog, Australia © *D. Hunter*

Cover design & layout by: Pritpal S. Soorae, IUCN/SSC Re-introduction Specialist Group

Produced by: IUCN/SSC Re-introduction Specialist Group & Environment Agency-ABU DHABI

Download document at: www.iucnsscscrg.org

Conservation and re-introduction to augment threatened orchid populations in Madagascar

Margaret M. From

Director of Plant Conservation, Center for Conservation & Research at Omaha's Henry Doorly Zoo, 3701 South 10th Street, Omaha, Nebraska 68107-2200, USA
(psl@omahazoo.com)

Introduction

Madagascar's orchids comprise approximately 1,000 currently classified species with nearly 80% endemism and many species that are on the verge of extinction due to the rapid conversion of forests to slash and burn agriculture. The island nation is a biodiversity hotspot of the highest concern according to IUCN. It is home to many animal and plant species found nowhere else on earth. The orchids in Ranomafana National Park are representative of orchid species that were once widespread in Madagascar's eastern rainforest region. The park offers a measure of protection to the orchids. However, most of the surrounding landscape has been burned and converted to crops in order to feed an impoverished human population. Malagasy orchids are among the island's most vulnerable plants partly due to the highly specialized niche they occupy in the forest which disappears quickly when the trees are destroyed by human activities or from the frequent cyclones that hit the island. A single downed tree may have provided support to dozens, and possibly hundreds of individual orchid plants, along with other epiphytic species. Illegal exploitation is another threat to the orchids.

Orchid seeds were collected in Ranomafana National Park under permits in collaboration with the Association Nationale Pour la Gestion Des Aires Protogees (ANGAP), the Madagascar Institute Pour La Conservation Des Environments Tropicaux (MICET), the University of Madagascar at Antananarivo and The Lab for Rare & Endangered Plants at Omaha's Henry Doorly Zoo, Omaha, Nebraska, USA. Concurrent propagation studies were conducted at the University in Antananarivo and at the Omaha Henry Doorly Zoo's plant research laboratory. The orchid plants resulting from the project were used for re-introductions



Re-introduced orchid on tree trunk

in Madagascar. Small samples of the remaining uncultured seeds were cryopreserved in liquid nitrogen at the zoo's frozen germplasm bank for use in future research projects and re-introductions in order to provide a back-stop to species extinctions.

Goals

- **Goal 1:** Conduct field surveys of the orchids found in Ranomafana National Park.
- **Goal 2:** Develop successful micropropagation protocols for the seeds.
- **Goal 3:** Provide biotechnology training and conservation education for Malagasy graduate students, professors, park guides and local residents near Ranomafana.

Success Indicators

- **Indicator 1:** Increase the number of orchid plants used for return to the native habitat, and re-establish them in areas where the seeds were originally collected, in order to augment current populations.
- **Indicator 2:** Long-term monitoring of success/failure rates for each of the orchid species re-introduced.
- **Indicator 3:** Develop a useful model for propagation and re-introduction to be used in Madagascar and other plant research projects conducted elsewhere.

Project Summary

The habitat where this project originated is a mountainous region characterized by high humidity, high rainfall and dense jungle that provides shady growing conditions. Eleven orchid species representing five genera were propagated *ex situ* and returned to Madagascar for re-introduction to the forest in Ranomafana National Park. The collection of 839 juvenile orchids represented members of *Aerantes*-6 species, *Aerangis*-1 species, *Bulbophyllum*-2 species, *Calanthe*-1 species and *Cryptopus*-1 genera. Orchids are over-exploited, often illegally, all over the world and Madagascar has seen its share of illegal collection of orchids that wind up being sold in the marketplace. Political instability in the country and a burgeoning population searching for any means to support families often results in pressure upon plants with economic value. The collaborative project enlisted local residents and graduate students in orchid propagation and re-introduction to promote regional conservation. Students and professors from the Madagascar University were given biotechnology training for micropropagation, cryopreservation and re-introduction techniques previously developed at the Omaha Henry Doorly Zoo plant laboratory in the United States. Juvenile orchids produced at the zoo were transported to Madagascar after a rigorous phytosanitary inspection in the United States and were also quarantined upon arrival in Madagascar prior to re-introduction in the forest.

The plants that were returned to Ranomafana National Park were transported, still in sterile cultures, and were acclimatized to the light and humidity regimes right at the re-introduction site. Transporting the plants in aseptic cultures prevented any pathogenic material being transferred between the two countries in order to avoid any environmental problems in the rainforest. A local resident was employed to



Aeranthes orchid

assist with the re-introductions and to make monthly monitoring expeditions to the park for follow up with the plants. Epiphytic species were attached to the trees by using natural materials such as local mosses and vines. The *Calanthe* species is both an epiphyte and a terrestrial species that readily adapted to the natural habitat when planted in the detritus near the base of trees. The overall survival rate was greater than had been anticipated, particularly encouraging since this was a pilot project to test whether orchids could survive when re-introduced to the rainforest directly from sterile *in vitro* cultures. The *Aerangis* species survived at 75.86%, *Aeranthes* species survived at an average of 63.84%, the *Calanthe* species survived at 80%, *Bulbophyllum* species averaged 15.74% survival and the *Cryptopus* species survived

at 100% after one year.

The *Bulbophyllum* species have roots that are thin and appear to have few reserves of nutrients or moisture and must be kept wetter than other species when they are reintroduced to the wild. Future re-introductions for that genus will be returned to the forest under improved techniques. All of the orchids continue to be monitored and after 5 years a number of the re-introductions have commenced blooming which indicates that those plants have now entered the reproductive stage, an important life stage for population sustainability. In order to engage Madagascar local schoolchildren in conservation they were taken on field trips to the park to observe orchids and other endemic plants in order to raise awareness of their own region's natural resources. An art contest sponsored at the local elementary school taught the children about the orchid structures and their particular role in forest biodiversity. Many of the schoolchildren had never before entered the park or been made aware of the importance the park's plant diversity holds for them and their country.

Major difficulties faced

- Timing of re-introductions with the proper season to increase survival rates.
- Choosing specific re-introductions sites and conditions that would allow orchid re-introductions to survive.
- The distance between the countries of the collaborators which increased costs.

- Concurrent studies at the Malagasy university were difficult due to inadequate facilities for aseptic micropropagation.

Major lessons learned

- *Ex situ* seed micropropagation allows for a large number of propagules produced. A single fruit removed from the wild produces many orchids with little or no impact on wild populations.
- Re-introductions are most successful for orchids when made at the outset of the rainy season to avoid excessive dehydration while plants are small.
- The host country will benefit most if project participants include local residents who have first hand knowledge of the local conditions needed for re-introduced plants.
- Each species has its own particular niche in the natural habitat which requires careful documentation and analysis to facilitate successful re-establishment.

Success of project

Highly Successful	Successful	Partially Successful	Failure
√			

Reason(s) for success/failure:

- This is the first known project of its kind to detail a successful re-introduction of orchids directly from sterile *in vitro* cultures into the natural habitat.
- Engaging local residents and students made the project successful and at the same time raised public awareness of the natural resources.
- The majority of the re-introduced plants survived past the five-year mark and have gone on to begin their reproductive cycle, indicating successful re-establishment in the wild.
- Seed samples were cryopreserved at Omaha's Henry Doorly Zoo to preserve germplasm that in some cases is irreplaceable.