



# 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](http://www.iucnsscscrg.org)

## Conservation Status and re-introduction of Bermuda's Governor Laffan fern-an endangered endemic

Margaret M. From

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

### Introduction

Bermuda's most endangered plant species; *Diplazium laffanianum*, is of great historical significance to the island nation. The species has not been reported from the wild since 1905 (Britton, 1918) and was reduced to only five living specimens housed at the Bermuda Botanic Gardens by 2003. It is listed as an endangered species by IUCN but is not on the CITES App. I. The species was a personal favorite of one of Bermuda's early governors and was later named the Governor Laffan fern in his honor. Long periods of isolation from other continents have resulted in unique island plant species which are particularly vulnerable to extinctions. Islands that are densely populated by humans such as Bermuda face extraordinary challenges to conservation for their endemic flora and fauna. The Bermuda Botanic Gardens provided tiny samples of spores collected from the remaining specimens for *ex situ* plant research at Omaha's Henry Doorly Zoo where the spores were germinated and grown under sterile laboratory conditions. Subsequently, many cultures containing hundreds of juvenile ferns were returned to Bermuda. The timing of the initiation for the first cultures was particularly fortuitous since Hurricane Fabian crashed into Bermuda shortly after the spores were sent to the United States for germination and the last adult specimens

remaining in Bermuda sustained sea water damage in the hurricane. The very existence of the last known adult plants was threatened and research producing additional young ferns was the only means to prevent its final extinction.

### Goals

- Goal 1: Bring the last known fern specimens into the reproductive stage to provide viable spores for *in vitro* germination.



Close up of *Diplazium laffanianum*

- Goal 2: Develop a successful protocol and medium for micropropagation of the fern spores.
- Goal 3: Provide young ferns for Bermuda's Botanic Garden that would be used to rehabilitate the species in its host country.

## Success Indicators

- Indicator 1: Successful germination and production of young ferns from the spore samples.
- Indicator 2: Produce large numbers of ferns for return to the host country Bermuda.
- Indicator 3: Re-introduce the young ferns to the local environmental conditions at the Bermuda Botanic Gardens for conservation research in Bermuda.

## Project Summary

The Bermuda islands consist of more than one hundred islands and outlying islets, many of which are not inhabited by humans. However, the main islands are among the most densely populated places on earth and natural areas have been reduced to tiny fragments, pushing the endemic flora to the verge of extinction in some cases. Tectonic plate movement deep within the Atlantic Ocean separated the Old World and the New World approximately 200 million years ago and Bermuda was formed by volcanic activities along the fault line left by the tectonic plate movements. Bermuda sits on this volcanic base that is covered by a cap of limestone formed from countless marine organisms. The native topsoil is only a thin layer of reddish soil supporting its plant life. Most of the endemic flora and fauna probably arrived through natural dispersal from North America but many non-native species arrived with successive waves of human colonization that began arriving in the 1500s. The Governor Laffan fern (*Diplazium laffanianum*) is Bermuda's most threatened native plant species. *Diplazium laffanianum* is now extinct in the wild and the last specimen was reportedly seen in the wild in 1905. The last known plants languished in an obscure corner of the Bermuda Botanic Gardens until the 1970s when the last five plants were moved to the government's Tulo Valley Nursery for safeguarding. The fern was reduced to only five living specimens by 2003 and a protocol for propagating the species had not been developed prior to this time. The species historically occupied areas at the entrances to Bermuda's limestone caves but development and habitat deterioration had altered the areas so drastically that today the original habitat no longer exists. With such a small population left on earth these last few individuals may have limited genetic diversity but the decision was made that whatever genetic diversity the species may still possess was worth saving.

A collaboration between the Bermuda Botanic Garden and Omaha's Henry Doorly Zoo was initiated in order to save the species from disappearing altogether. The plant research laboratory at Omaha Henry Doorly Zoo was enlisted to propagate the species *ex situ*. Cloning one of the remaining specimens was not considered a good conservation practice and an alternative plan was developed to carefully tend the adult plants until they would begin producing spores in hopes of retaining what genetic diversity the last specimens might possess. After several months of care at the Bermuda nursery two of the remaining specimens produced small

amounts of spores which were sent for culturing to Omaha's Zoo. After several attempts at culturing them the fern spores began to germinate rapidly and *in vitro* cultures containing hundreds of little ferns were hand carried back to Bermuda for growing on at the Bermuda Botanic Garden. A series of four shipments containing many young ferns have been returned to Bermuda over the last six years. The area where the species was last seen in the wild no longer exists as a natural area. Therefore the species must be cultivated and maintained *ex vitro* at the botanic garden for the foreseeable future or until a restored habitat location can be provided. Nursery personnel at Tulo Valley Nursery and the Ministry of the Environment in Bermuda reserve responsibility for monitoring the young plants and growing the ferns on to a mature stage. Any re-introductions made to the natural habitat are determined by the same Bermudian authorities.

### Major difficulties faced

- Careful consideration must be made for the return of the ferns to the host country in order to coincide with the best growing months.
- Limited source materials from a small population.
- No published culture methods are available for the species.
- *Ex vitro* acclimatization methods are complex for this sensitive species.
- *Diplazium laffanianum* spores have a very limited viability period making propagation timing critical.

### Major lessons learned

- Spore condition, type and age have critical impact on propagation of the species.
- Re-introduced ferns require careful monitoring.
- Adaptive management methods must be employed for the plants due to their specific growth requirements.
- Cooperation between collaborators is necessary for successful re-establishment.

### Success of project

Highly Successful	Successful	Partially Successful	Failure
	√		

### Reason(s) for success/failure:

- A species was saved from final extinction.
- The project continues to produce many young ferns *in vitro* for future re-establishment in Bermuda.
- Successful protocols were developed for propagation and acclimatization of this fern that are useful for the collaborators as well as to other plant re-introduction projects.