# Global Re-introduction Perspectives: 2016

## Case-studies from around the globe

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IUCN/SSC Re-introduction Specialist Group (RSG)

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**Cover photo:** Clockwise starting from top-left:
i. Bolson's tortoise, USA @ Turner Endangered Species Fund
ii. Wetapunga, New Zealand @ Richard Gibson
iii. Morelos minnow, Mexico @ Topiltzin Contreras-MacBeath
iv. *Silene cambessedesii*, Spain @ Emilio Laguna
v. Tasmanian Devil, Maria Island, Tasmania @Simon DeSalis
vi. Agile frog, Jersey @ States of Jersey Department of the Environment

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# Re-introduction of the northern corroboree frog in the Northern Brindabella Mountains, New South Wales, Australia

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## Introduction

The northern corroboree frog (*Pseudophryne pengilleyi*) is a small Myobatrachid frog native to the Brindabella and Fiery Ranges of New South Wales and the Australian Capital Territory in south-eastern Australia. The species has suffered dramatic declines over the last 30 years and has disappeared from the majority of its former range. It is estimated that populations within the Northern and Southern Brindabella mountains, which are two of the three recognized distinct genetic populations or evolutionary significant units (ESUs), have less than 200 mature individuals remaining.

The decline of this species has been primarily due to the introduced fungal pathogen, amphibian chytrid fungus (*Batrachochytrium dendrobatidis*), though other factors may have contributed on a lesser scale, including climate change, exotic weeds and habitat degradation due to introduced fauna species (Hunter *et al*., 2010; Scheele *et al*., 2012). The species is listed as Critically Endangered in

Northern corroboree frog

Release of 1 year old frogs

NSW under the *Threatened Species Conservation Act 1995* and Federally under the *Environment Protection and Biodiversity Act 1999*. It is also listed as Endangered by the IUCN and in the ACT under *Nature Conservation Act 1980*.

## Goals

- Goal 1: Establish a sustainable *ex-situ* colony of the *P. pengilleyi* Northern Brindabella ESU and maintain as a genetically-viable insurance colony.
- Goal 2: Ensure the persistence of *P. pengilleyi* in the Northern Brindabella mountains by supplementing wild populations with captive-bred stock.
- Goal 3: Develop efficient and reliable re-introduction protocols by assessing the effectiveness of releasing different life-stages.

## Success Indicators

- Indicator 1: Have developed successful captive husbandry and reproduction techniques.
- Indicator 2: Sufficient numbers of offspring to facilitate re-introduction efforts have been produced.
- Indicator 3: Post-release survival to sexual maturity of individuals released at different life-stages has been quantified.
- Indicator 4: Breeding populations of *P. pengilleyi* in the Northern Brindabella mountains continue to persist.

## Project Summary

**Feasibility:** The Northern Brindabella ESU of *P. pengilleyi* has been in continual decline since the arrival of chytrid fungus over three decades ago. In 2010, annual surveys indicated that the number of mature calling males had dropped to 66 calling males. By 2012, only three calling males were located throughout breeding sites within the ESU. These results suggest that population numbers at existing sites are at critically low levels and are at risk of extinction. Between 2003 and 2005, eggs were collected from a number of wild nests and taken to Tidbinbilla Nature Reserve to establish an insurance colony for this population. During 2010 and 2011, most of this captive colony was transferred to Taronga Zoo, Sydney. Successful breeding protocols have been established for this species at both institutions.

Within the Northern Brindabella mountains, the habitat of the species remains largely intact, with numerous suitable breeding sites. As far as can be discerned, chytrid fungus is present at all suitable release sites available to the species. However, despite the presence of the fungus, the species rate of decline has been relatively gradual over the past three decades. This indicates that it may be feasible to maintain wild populations of the species in the presence of the pathogen with supplementation from an *ex-situ* colony.

Ensuring the persistence of *P. pengilleyi* in the Northern Brindabella Ranges will assist the broader recovery program through maintaining the species existing genetic variation, and allowing ongoing field research into techniques to mitigate the impact of the chytrid fungus. Additionally, enabling the population to persist in the presence of the chytrid fungus may allow the possibility of continued selection for resistance to disease caused by this pathogen.

**Implementation:** Two release sites were selected in the Northern Brindabella Mountains that until recently maintained significant populations of *P. pengilleyi* and were reasonably resilient to pool drying during the period of tadpole development. Eggs and tadpoles were released in 2010 (179), 2011 (146), 2013 (167) and 2014 (293), evenly divided between the two sites. All releases were undertaken between July and September, coinciding with when wild tadpoles would be at a similar stage of development.

In December 2014, 160 one-year old frogs and 49 five-year old frogs were released, with numbers of each cohort also divided evenly between the two sites. Sex ratios of the adult frogs were split evenly between the two sites. The juveniles frogs could not be sexed so were randomly assigned to each site. Undertaking releases at various life stages has been conducted to assess the most effective re-introduction technique to establish populations of this species, taking into account the cost implications of rearing individuals to a later stage of development in captivity. Just prior to release, each of the frogs was weighed, measured and had photographs taken of their ventral and dorsal surfaces to permit individual identification upon recapture using pattern recognition.

**Releasing tadpoles in the Northern Brindabella Mountains**

**Post-release monitoring:** Annual monitoring has been conducted at each of the two release sites since 1999,

during the peak breeding season from late February to early March. Monitoring is conducted using a shout-response technique that has a high confidence of detecting mature calling males (Scheele *et al.*, 2012). The number of mature females is estimated based on the number of clutches within male nests. Due to their cryptic nature, there are no techniques to monitor immature individuals.

Surveys in March 2014 detected 7 males at each of the two release sites, though no eggs were laid in any of their nests. Due to the low number of adults at release sites between 2009 and 2011, and the lack of detection of frogs since 2011, it is suspected that these individuals were likely from the first tadpole releases in 2010. This is supported by length of time to maturity, with males typically maturing at 3 years in the wild, whilst females mature at 4 years. Thus in 2014, males from the 2010 tadpole release would be mature at just over 3 years of age, whilst the females may not, resulting in the perceived sexual bias.

In March 2015, seven males were detected at one site, whilst 13 were detected at the second site. At the end of the breeding season, the nests were inspected to identify and photograph males and assess their size. From the 20 nests, 12 males were still present upon inspection, of which four were identified by markings as being released 3 months earlier. At the latter release site, eggs were detected within 4 nests representing between 12 - 15 clutches of eggs.

## Major difficulties faced

- The inability to detect frogs prior to maturity due to their small size and cryptic nature prevents the tracking of released young (eggs, tadpoles & juvenile frogs) animals for up to 4 years after their release.
- No practical technique to track females (because they do not call), reliance on limited data from opportunistic sightings in nests.
- Limited ability to directly link breeding adults with cohorts of released eggs. With additional funding it may be possible to do this using genetic techniques.
- The small size of the captive population and the low number of eggs produced by this species limits the number of offspring available for re-introduction.

## Major lessons learned

- Survivorship to maturity can be achieved despite the persistence of chytrid fungus. Hence, it should be possible to maintain wild populations via a captive breeding and supplementation program.
- Presence of the chytrid fungus should not be a factor preventing re-introduction attempts as this will reduce the ability to gain increased knowledge of the disease dynamics in *P. pengilleyi* and prevent any possibility of selection for resistance to the disease.

## Success of project

| Highly Successful | Successful | **Partially Successful** | Failure |
|---|---|---|---|
| | | √ | |

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

- Successful captive reproduction has been achieved in each year attempts were undertaken, facilitating the provision of offspring for re-introduction efforts.
- Survivorship of a small proportion of released tadpoles to maturity at the two sites has been attained from the first cohorts of eggs and tadpoles released.
- It is too early in the program to declare this project to be a success or failure, as this will require at least another 5 years of post-release monitoring.

## References

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