

GLOBAL RE-INTRODUCTION PERSPECTIVES

Re-introduction case-studies from around the globe



**Edited by
Pritpal S. Soorae**



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, Environment Agency - Abu Dhabi or Denver Zoological Foundation.

Published by: IUCN/SSC Re-introduction Specialist Group

Copyright: © 2008 IUCN/SSC Re-introduction Specialist Group

Reproduction of this publication for educational or other non-commercial purposes is authorized without prior written permission from the copyright holder provided the source is fully acknowledged.

Reproduction of this publication for resale or other commercial purposes is prohibited without prior written permission of the copyright holder.

Citation: Soorae, P. S. (ed.) (2008) GLOBAL RE-INTRODUCTION PERSPECTIVES: re-introduction case-studies from around the globe. IUCN/SSC Re-introduction Specialist Group, Abu Dhabi, UAE. viii + 284 pp.

ISBN: 978-2-8317-1113-3

Cover photo: Clockwise starting from top-left:

- Formosan salmon stream, Taiwan
- Students in Madagascar with tree seedlings
- Virgin Islands boa

Produced by: IUCN/SSC Re-introduction Specialist Group

Printed by: Abu Dhabi Printing & Publishing Co., Abu Dhabi, UAE

Downloadable from: <http://www.iucnsscrg.org> (downloads section)

Contact

Details: Pritpal S. Soorae, Editor & RSG Program Officer
E-mail: psoorae@ead.ae

Re-introduction of the red squirrel into Newborough forest on the island of Anglesey, UK

Craig Shuttleworth¹, Robert Kenward² & Nick Jackson³

¹ - Woodland Ecologist, Menter Môn, Bryn Cefni Estate, Llangefni, Isle of Anglesey, LL77 7XA, UK (craig@redsquirrels.info)

² - Fellow, Centre for Ecology & Hydrology, Benson Lane, Crowmarsh Gifford, Wallingford, OX10 8BB, UK (reke@ceh.ac.uk)

³ - Director, The Welsh Mountain Zoo, Colwyn Bay, Conwy, LL28 5UY, UK (nick@welshmountainzoo.org)

Introduction

The red squirrel (*Sciurus vulgaris*) is an arboreal rodent found in temperate forests throughout much of the Palaearctic. It is vulnerable to habitat fragmentation and woodland loss, and in Eurasia faces competition and pathological viral disease carried by the introduced North American eastern grey squirrel (*Sciurus carolinensis*), which is spreading from introduction sites in the United Kingdom and Italy. The species is included in the IUCN Red List where it is described as 'near threatened' and is also listed under Article III of the Berne Convention. It is protected under Schedules 5 and 6 of The UK Wildlife & Countryside Act 1981, legislation which was amended by the Countryside & Rights of Way Act 2000 for England and Wales. There is a UK Species Action Plan to facilitate the conservation and recovery of populations. Anglesey is a 720 km² island lying on the north coast of Wales, UK. The coastal commercial pine plantation of Newborough forest is located on the south east tip of the island and contained red squirrels until their extinction in the mid-1990s.

Goals

- Goal 1: The eradication and then exclusion of grey squirrels from Newborough forest.
- Goal 2: The establishment of a captive red squirrel colony *in situ* to produce juveniles for release.
- Goal 3: The re-introduction of red squirrels to establish a self sustaining population.

Success Indicators

- Grey squirrel completely eradicated from the forest prior to the release of red squirrels.
- No evidence of red squirrels being infected with squirrel-pox



Red squirrel (*Sciurus vulgaris*)



Newborough forest release site

virus, a disease carried by grey squirrels and which is fatal to indigenous red squirrel populations.

- Reproduction within the captive red squirrel population, and the successful weaning, and survival to release, of young animals.
- Evidence of reproduction in the released population and favorable rates of survival relative to established wild populations.
- Progressive expansion of both red squirrel abundance and geographical distribution.
- The development of a self

sustaining wild red squirrel population in the forest.

Project Summary

Feasibility: Newborough forest is a 770 ha coastal commercial coniferous conifer plantation dominated by stands of mature Corsican pine (*Pinus nigra*). The red squirrel had become extinct in the forest during the mid-1990s as a direct result of grey squirrel colonization. In 1998, it was recognized that, as an island, Anglesey offered a unique opportunity to eradicate the grey squirrel and reinstate the red squirrel. The removal of grey squirrels from a second conifer plantation on the island, Mynydd Llwydiarth forest, had already facilitated the recovery of the remnant red squirrel population there, and had demonstrated that woodland habitat could be maintained free from grey squirrels. The red squirrel is an iconic and popular native mammal, and remnant populations are important in a socio-economic context as they are a major natural attraction for tourists. UK red squirrel conservation strategies recommend systematic grey squirrel control and have stressed the need for studies to investigate the relative efficacy of captive-bred and translocated animal releases. The re-introduction of the red squirrel into Newborough forest therefore offered both conservation and local economic benefits.

Implementation: Five large woodland enclosures were constructed in the spring of 2003, and subsequently captive bred red squirrels were obtained via the Zoological Society of Wales. Genetic sequencing on hair samples collected from a proportion of these individuals ensured suitable genetic diversity was present within the founding population. A trial release was carried out in May 2004 using three adults in order to assess behavior and settlement patterns prior to the main release. The remaining animals were held separately in mixed sex pairs or trios, and were used as breeding stock. Captive animals were regularly screened for endo-parasites, particularly coccidia, and any carcasses were sent for appropriate histology and viral screening by a veterinary pathologist. In the three years from 2004 to 2006, twenty red squirrels were released into the surrounding forest using soft-release protocols. Whilst housed in captivity the animals were provided with

suitably designed nest boxes and both natural and supplemental foods. On release the squirrels were able to use additional nest boxes and feeding stations in the adjacent stands. A systematic grey squirrel eradication program began in 2002. This was continued throughout the captive breeding and subsequent release of red squirrels. Captured grey squirrels were euthanized and a blood sample screened for squirrel-pox anti-bodies.

Post-release monitoring: Three adults released in 2004 were fitted with radio-tags and data collected on ranging behavior and nest site selection. Nest boxes and live-trapping provided data on reproduction and revealed that the single female produced two litters of young within six months of release. Two of the three animals survived at least 18 months after release. The captive red squirrels were productive and females typically produced at least one litter, and occasionally two. Adult survival was also favorable at 67 - 78% except in 2005, when three adult pairs and several young captive squirrels were lost from a suspected viral infection. In 2007 the deaths of three juveniles were associated with adenovirus infection. As a new threat for red squirrels, this virus is now the subject of government veterinary investigation; the Anglesey deaths are an important research case.

Live trapping of released animals revealed steady geographical expansion of red squirrel distribution and regular breeding in the wild. In May 2007, three years after the first release, 13 breeding females were trapped in the forest. During the intervening three years a total of five wild born litters were discovered in nest boxes. Nest box inspection also first revealed the presence of a red squirrel possibly infected with squirrel-pox. Subsequent trapping suggested that although additional animals may have been lost, a significant number of adults and young lived through this period. Live trapping demonstrated that although the grey squirrel population had been almost eliminated, up to 10 individuals, were present in the forest each year. Achieving permanent eradication had been underestimated, so the project reassessed the trapping strategy. Continuing island-wide grey squirrel eradication is scheduled to be complete in 2010.

Major difficulties faced

- Preventing grey squirrel ingress into the study site, which was an optimal coniferous habitat for the species, proved to be more of a challenge than was anticipated and subsequently led to a review of trapping protocols.
- Grey squirrels carry a 'squirrel-pox' virus as a latent or sub-clinical infection, and this causes pathological disease in indigenous red squirrel populations. Unfortunately the mechanism of inter-specific infection has not been precisely identified and this means that protocols aimed at halting any outbreak can only be general in nature.
- The discovery of an adenovirus which was associated with the deaths of several captive red squirrels was unexpected. The disease had previously only been recorded in two localities and viral research is still at an early stage; there are consequently currently no recommendations for managing the infection.

Mammals

Major lessons learned

- If introduced competitors mediate competition through disease, it is imperative that they are permanently removed from a release area. This study demonstrated that the persistence of only a few grey squirrels was an unacceptable disease risk.
- Discovery of adenovirus in wild and captive red squirrels was unexpected but contingency plans proved generally robust. The project has given data which will be useful to future release projects and highlighted the need for a better understanding of the role of pathological disease in red squirrel population dynamics.
- Captive bred red squirrels have an important role in the conservation of the species in the UK and their use removes the need to source stock from wild populations.

Success of project

Highly Successful	Successful	Partially Successful	Failure
	√		

Reasons for success/failure:

- It was demonstrated that, through the use of soft release protocols, captive bred animals can be released into the wild where they establish home ranges and reproduce.
- A productive and widespread wild red squirrel population was successfully established in the forest.
- Previous re-introductions and population supplementation projects have proved to be challenging and often unsuccessful. The reason for this has been identified as the continued presence of grey squirrels within the habitat. In this project we were unable to prevent small numbers of grey squirrels from living within the forest.