



## **COLLABORATION FOR ENVIRONMENTAL EVIDENCE**

**SYSTEMATIC REVIEW No. 86.**

### **WORKING TITLE: REINTRODUCTION OF ENDANGERED ANIMAL SPECIES: COMPLEMENTING THE IUCN GUIDELINES**

**DRAFT REVIEW PROTOCOL**

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## COVER SHEET

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## 1. BACKGROUND

A reintroduction is “an attempt to establish a species in an area which was once part of its historical range, but from which it has been extirpated or become extinct”. A translocation is a “deliberate and mediated movement of wild individuals or populations from one part of their range to another” (IUCN 1998).

Reintroductions and translocations are frequently used methods in conservation biology. Griffith et al. (1989) estimated that 700 of such programmes were undertaken yearly in North America alone. According to an IUCN Reintroduction Specialist Group (RSG) database, there are 489 animal species in focus of recent, current or planned reintroduction efforts for conservation purposes (Seddon et al. 2005). However, a recent assessment estimates that only 11-62% of these programmes are clearly successful (Table 1.). Many releases fail because the vast majority of animals frequently die soon after release (Teixeira et al. 2007). Furthermore, reintroduction programmes can be expensive - they can cost several thousand dollars per year, sometimes even up to \$ 1 million (Fischer & Lindenmayer 2000; Teixeira et al. 2007).

Table 1. Outcome of reintroduction programmes according to different reviews.

	Griffith et al. (1989), n=198	Beck et al. (1994), n= 72	Fischer & Lindenmayer (2000), n=180	Singer et al. (2000), n=100	Matson et al. (2004), n=21
<b>Type of programmes</b>	Translocations of endangered species	Reintroductions with captive breeding	Reintroductions (conservation and other purpose mixed)	Reintroductions, augmentations	Reintroductions
<b>Taxa</b>	Mammals and birds	All groups of animals	All groups of animals	Bighorn sheep ( <i>Ovis canadensis</i> )	Black-faced impala ( <i>Aepyceros melampus</i> )
<b>Successful</b>	44%	11%	26%	41%	62%
<b>Uncertain</b>	-	89%	47%	29%	-
<b>Unsuccessful</b>	56%		27%	30%	38%

To improve the situation, the Reintroduction Specialist Group of IUCN has compiled in 1995 a set of guidelines for practitioners planning and carrying out reintroduction programs (IUCN 1998). The 11 pages long document gives practical advice in 52 bullets about things to do before, during and after the programs. These are the most widely used guidelines for conservation reintroductions: they were used e.g. during the planning of at least half of the wildfowl reintroduction programs (Lee & Hughes 2008), the Hungarian meadow viper (*Vipera ursinii rakosiensis*) reintroduction program (Halpern pers. comm.), and several European ground squirrel (*Spermophilus citellus*) translocation programmes in Hungary (Váci pers. comm.)

During the 14 years elapsed since the elaboration of the guidelines, a great amount of experience have accumulated, which appears in the quantity of the specialist literature: more than 100 new scientific journal articles, book sections, conference

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papers etc. appear every year (Bajomi et al. In press). There are some factors which are missing from the booklet of IUCN - e.g. the importance of translocating together familiar individuals at social species (Shier 2006). It is therefore worthy reviewing the accumulated evidence to critically appraise the existing points of the guidelines and catch new factors with which the guidelines could be extended. This would involve the formulation of appropriate evidence-based management guidelines and highlight gaps in present knowledge. The work would have great practical value, because it would surely increase the success of reintroductions.

Reintroductions for conservation purposes are in the scope of this review, including programmes dealing with captive-bred animals, as well as relocated and translocated ones.

During our work on the review, we are limiting bias by using a comprehensive literature searching, specific inclusion criteria, and formal assessment of the quality and reliability of the studies retrieved.

## 2. OBJECTIVE OF THE REVIEW

### 2.1 Primary question

- What factors influence the success rate of reintroduction of endangered animal species, outside those mentioned in the IUCN RSG guidelines (IUCN 1998)?

Table 3. Definitions of components of the primary systematic review question.

Subject	Intervention	Outcome
Locally extinct animal species (invertebrates, amphibians, reptiles, birds and mammals)	Reintroductions for conservation purposes (including captive-breeding, relocations and translocations)	Establishment of a self-sustainable population (see Appendix 1).

### 2.2. Secondary questions

- What is the amount of literature accumulated in the subject of animal reintroductions?
- Is there a taxonomic bias in the distribution of the reintroduction literature?
- How the literature is distributed across journals and different types of media (e.g. scientific journals, books, conference proceedings)?

## 3. METHODS

### 3.1 Search strategy

#### 3.1.1. Searching online databases and catalogues

Searches have already been performed in eight computerised databases and catalogues (Table 4.).

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Table 4. Computerised databases and catalogues used for the bibliographic searches.

Database	Web address
ISI Web of Knowledge	www.isiknowledge.com/
Scopus	www.scopus.com
ScienceDirect	www.sciencedirect.com
Copac	http://copac.ac.uk
Index of Theses Online	www.theses.com
Science Conference Proceedings	www.osti.gov/scienceconferences/
Science.gov	http://www.science.gov/
ISI Proceedings	www.isiknowledge.com/

The citations retrieved from each search have been recorded within an EndNote reference manager database. Searches were based on English language search terms presented in Table 5.

Table 5. English language search terms used for the searches (\*indicates a wildcard).

Search engines with wildcard ability	Search terms replacing the wildcard term in search engines without wildcard ability
(reintroduc* OR re-introduc*) AND species	reintroduction OR reintroductions OR reintroduced OR reintroducing
translocat* AND conservation AND species	re-introduction OR re-introductions OR re-introduced OR re-introducing
reintrod* AND conservation	translocation OR translocations OR translocated OR translocating
“captive breeding” AND reintroduce*	relocation OR relocations OR relocated OR relocating.
“captive bred” AND reintroduce*	
“back into the wild”	
(“captive rearing” OR “captive-reared”) AND reintroduce*	

Seddon et al. (2007) found that the four top journals for reintroduction-related papers were Biological Conservation, Conservation Biology, Journal of Wildlife Management and Oryx. These journals were searched separately for the term “reintroduction” in Web of Science, and manually searched from January 2006, because important and new articles can be “hidden” in the last year as they are not yet cited by others. The “Times cited” option in ISI Web of Knowledge was used for three highly cited papers – Griffith et al. (1989), Short et al. (1992), Snyder et al. (1996)- to retrieve relevant articles citing these papers.

Last searches were performed in February 2008, so data cover mostly the period until 2007, with some sporadic results in 2008. An update will be undertaken in January 2010 to catch results for the period of 2008-2009.

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An Internet search will also be undertaken with Google. The first 50 hits will be fully viewed and than the next fifty will be checked for any relevant hits.

### 3.1.2. Study inclusion criteria

The following inclusion criteria were applied by one reviewer reading the titles and abstracts of the papers:

**-Relevant subject(s):** locally extinct animal species (invertebrates, amphibians, reptiles, birds and mammals).

**-Types of intervention:** reintroductions for conservation purposes (including captive-breeding, relocations and translocations).

**-Types of study:** all studies presenting primary data about a relevant subject and intervention have been included, as well as relevant secondary and theoretical studies. We included the latter two types because they also can be of interest to conservation managers.

Articles not meeting the above criteria were excluded from our database.

### 3.2. Bibliographies

We integrated in our EndNote database the following bibliographies:

-454 recent (1990-2005) peer-reviewed papers collected by Seddon et al. (2007),

-the IUCN Reintroduction Specialist Group (RSG) Literature Database with 1789 references (Soorae 2002) – this is the catalogue of the IUCN RSG library,

- the Kenyon (1995) bibliography with 633 citations,

- the bibliography compiled by Armstrong (2008) with 197 citations.

General statistics from the 26 volumes of Re-introduction News (the publication of the IUCN RSG) were counted and added to the statistics. Only reports on reintroduction programs were taken into account from this publication, articles about specialist group membership, events, etc. were excluded.

Many references appeared several times during the searching and bibliography-importing process – duplicates were eliminated from the database. Most of the resulting publications were in English; a small number of French, Spanish, German and Hungarian references came mostly from the bibliographies.

Searching the online databases, filtering with the study inclusion criteria and importing the bibliographies resulted in a database of 3,776 publications related to animal reintroductions, with an overall page number of at least 29,290 pages. This database will soon be publicly available on the website [www.greenfo.hu](http://www.greenfo.hu).

### 3.3 Narrowing the scope and second level of filtering

Ideally, all 3 776 publications should be screened in search of factors missing from the IUCN guidelines (IUCN 1998). This would be a work going beyond the deadline of one year remaining for the lead reviewer to finish his work. Therefore, assuming that the reintroduction guidelines were compiled in 1995 with the knowledge of the previously existing literature, we restrict the scope to publications published since 1995.

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After the restriction, about 1000 records will remain in the database. We will then apply a second level of filtering, choosing those references which deal with factors related to success. The following criteria will be applied:

**-Relevant subject(s):** locally extinct animal species (invertebrates, amphibians, reptiles, birds and mammals).

**-Types of intervention:** reintroductions for conservation purposes (including captive-breeding, relocations and translocations).

**-Types of study:** all studies presenting data about a factor involved in the success of a relevant intervention on a relevant subject, except those factors already mentioned by the IUCN guidelines.

Articles not meeting the above criteria will be excluded from our new database.

### **3.4. Study quality assessment**

The quality of the studies viewed at full text will be assessed by one reviewer with reference to a second reviewer in cases of uncertainty. Disagreement regarding study quality will be resolved by consensus, or following assessment by a third reviewer. Articles will be either excluded from the review or admitted to different categories of information quality. The reviewer will assess the quality of the studies according to a hierarchy of evidence adapted from models of the systematic review process used in medicine and public health (Pullin & Knight 2003); e.g. a site comparison with before and after introduction metrics would be weighed higher than a time series study, all other factors being equal.

### **3.5. Data extraction strategy**

In our EndNote database, we categorized the references according to subject taxa (invertebrates, fish, amphibians, reptiles, birds and mammals) and type of publication (book, book section, conference paper & proceedings, edited book, electronic source, generic, magazine article, manuscript, newspaper article, report, scientific journal article, specialist newsletter article, thesis).

Data on the factors of success will be extracted by one reviewer, and a subset of the selected studies will be checked by a second reviewer to check data hygiene and verify the robustness and repeatability of the data extraction. Data regarding the study characteristics, quality, design and results will be recorded using data extraction forms. It is likely that these forms will be subject to amendment following consultation with subject experts, statisticians and piloting the process of data extraction. Where information regarding the reasons for heterogeneity is presented in the studies, it will be recorded.

### **3.6. Data synthesis**

Summary statistics about our database on the reintroduction literature and answers to the secondary questions of our review are currently under publication (Bajomi et al. In press).

To answer the primary question “What factors influence the success rate of reintroduction of endangered animal species, outside those mentioned in the IUCN

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RSG guidelines (IUCN 1998)”, a qualitative synthesis will be undertaken. We will suggest the inclusion of new bullets into the IUCN guidelines. Directions for further research will be given as well.

#### **4. ACKNOWLEDGMENTS**

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#### **5. POTENTIAL CONFLICTS OF INTEREST AND SOURCES OF SUPPORT**

No conflicts of interest to be declared.

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## **Appendix 1.**

### **Definition of success**

The IUCN/SSC Re-introduction Specialist Group's "Guidelines for re-introductions" (IUCN 1998) state that "the principle aim of any re-introduction should be to establish a viable, free-ranging population". In the literature, at least twelve different definitions exist to define the success of a reintroduction program (Scott & Carpenter 1987; Griffith et al. 1989; Beck et al. 1994; Sarrazin & Barbault 1996; Wolf et al. 1998; Seddon 1999; Fischer & Lindenmayer 2000; Komers & Curman 2000; Singer et al. 2000; Towns & Ferreira 2001; Richards & Short 2003; Matson et al. 2004).

Data for the following four definitions will be collected from the studies reviewed:

1. a genetic or demographic analysis (e.g. Population Viability Analysis, or Population and Habitat Viability Analysis) predicts that the population will be self-sustaining (Beck et al. 1994),
2. a continuous variable will be constructed, representing the outcome of translocations, incorporating its persistence (years) since the year of the last release of animals, and its classification as self-sustaining, declining or gone. The persistence of the population will be divided by the maximum potential life span in the wild of the species to scale for the variability in species longevity (Wolf et al. 1998).
3. the first wild-born generation breeds (Sarrazin & Barbault 1996; Seddon 1999),
4. the population growth rate is positive during a period of three generations, or ten years (derived from IUCN 2001).