CENTRE FOR EVIDENCE-BASED CONSERVATION

SYSTEMATIC REVIEW No. 33

WORKING TITLE: ARE WILD DOG RE-INTRODUCTIONS IN SOUTH AFRICA AN EFFECTIVE CONSERVATION TOOL?

FINALISED REVIEW PROTOCOL

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1. **BACKGROUND**

The African wild dog (*Lycaon pictus*) is an intensely social species in danger of extinction if nothing is done to halt its decline (Woodroffe *et al.* 2004). In South Africa, in an effort to restore wild dog numbers in increasingly fragmented landscapes and to complement the single viable population occurring in Kruger National Park, a plan was launched to manage separate sub-populations of wild dogs in several small, geographically isolated conservation areas as a single meta-population (Mills *et al.* 1998). This intensive management approach involves the re-introduction of wild dogs into suitable conservation areas, and periodic translocations among them to mimic natural dispersal and maintain gene flow.

This conservation strategy is largely based upon expert opinion (Wild Dog Advisory Group of South Africa – WAG–SA) and there has been no predictive framework available to quantify which re-introduction techniques are the most efficient, despite the initial failures and high costs associated with wild dog re-introductions and translocations. Consequently, Gusset *et al.* (2007) sought to elucidate those factors that have affected the survival of re-introduced wild dogs and their offspring, with survival of and breeding by the release generation being a pragmatic criterion for short-term re-introduction success (Seddon 1999). Using an information-theoretic approach, known-fate modelling in program MARK was employed to estimate the survival of re-introduced wild dogs and their offspring, and to model covariate effects relative to survival. Survival analysis revealed that the determinants of re-introduction success can be reduced to two factors relevant for management, suggesting that wild dog re-introductions should be attempted with socially integrated animals that are released into securely fenced areas.

What remains unclear, however, is how the statistical approach used affected the outcome of the evaluation. Several factors hypothesized by experts to impact survival were found not to have an effect, including controversial interventions such as vaccination and predator control, whereas expensive measures such as fencing and pre-release socialization had a positive impact on survival. Using a systematic review approach, we propose to re-evaluate the determinants of re-introduction success in this actively managed meta-population of wild dogs in South Africa, which represents one of the most extensive efforts to date to re-introduce an endangered species.

2. **OBJECTIVE OF THE REVIEW**

   2.1   Primary question
   Are attempts to re-introduce wild dogs in South Africa effective?

   2.2   Secondary question *(if applicable)*
   What are the determinants of re-introduction success in wild dogs?

3. **METHODS**

   3.1   Search strategy
   Data on the survival of re-introduced wild dogs and their offspring as well as on covariates potentially impacting survival are available from all wild dog re-introductions and translocations known to have been

attempted in South Africa since 1995 (Gusset *et al.* 2007; Appendix 1). Survival data were collected by post-release monitoring from 12 re-introduction sites and 18 release events, resulting in a total of 256 individual records (127 released wild dogs that produced 129 pups). Gusset *et al.* (2007) quantified the survival of re-introduced wild dogs 6, 12, 18 and 24 months after release and that of pups produced to 6 and 12 months of age (Appendix 2). In addition, 40 covariates hypothesized to impact survival, collated from extensive individual experiences, were quantified (Gusset *et al.* 2007; Appendix 3).

To verify that no additional data exist, relevant people and organisations (most notably WAG–SA) involved in wild dog re-introductions and translocations will be contacted. Web of Science, CAB Direct, Science Direct and Ecology Abstracts will be searched, using the search string ("African wild dog*" OR "Lycaon pictus") AND (re-introduction* OR reintroduction* OR translocation*).

3.2   Study inclusion criteria
- **Relevant subject(s):** African wild dog (*Lycaon pictus*) (Table 1)
- **Types of intervention:** re-introduction (Table 1)
- **Types of comparator:** 40 covariates varying with re-introduction site and release event (Appendix 3)
- **Types of outcome:** survival rates of re-introduced wild dogs and their offspring to 6, 12, 18 and 24 months after release or birth (Table 1; Appendix 2)
- **Types of study:** any study providing survival data for re-introduced wild dogs and their offspring will be considered. Gusset *et al.* (2007) summarized the available data on all known wild dog re-introduction and translocation attempts in South Africa up to 2005 (Appendix 1)
- **Potential reasons for heterogeneity:** large variety of management strategies used and factors potentially impacting survival

Table 1. Definition of components included in systematic review

Subject	Intervention	Outcome
African wild dog (*Lycaon pictus*)	Re-introduction	Survival rates of re-introduced wild dogs and their offspring to 6, 12, 18 and 24 months after release or birth

3.3   Study quality assessment: as all re-introduced wild dogs were sufficiently monitored after release, data from different re-introductions sites and release events are likely to be of equal quality

3.4   Data extraction strategy: raw data on survival and covariates potentially impacting survival are available from Gusset *et al.* (2007)

3.5   Data synthesis: meta-analysis of outcome measures (i.e. survival rates of re-introduced wild dogs and their offspring) to generate effect sizes,

with meta-regression and sub-group analysis used to examine reasons for heterogeneity in outcome measures (i.e. determinants of re-introduction success)

4.   POTENTIAL CONFLICTS OF INTEREST AND SOURCES OF SUPPORT

No potential conflicts of interest and no sources of support.

5.   REFERENCES

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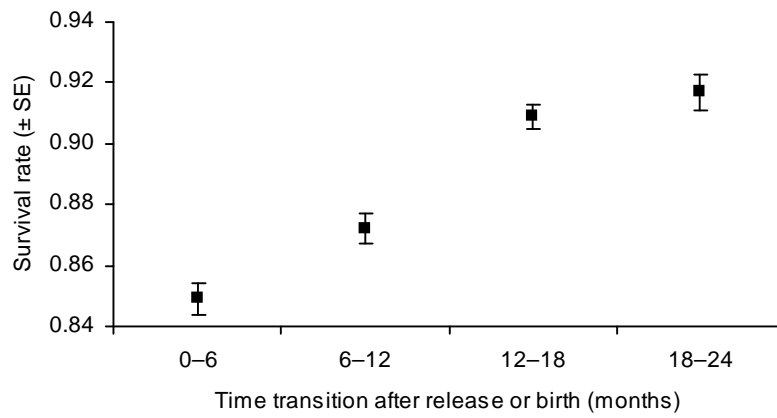
Appendix 1. Wild dog re-introductions and translocations in South Africa (up to 2005).

Release site	Province	Geographic position	Release date(s)
Balule Nature Reserve	Limpopo	24°13' S / 30°59' E	2005
Hluhluwe-iMfolozi Park	KwaZulu-Natal	28°05' S / 31°56' E	1980/1981 (4x)[a], 1986[a], 1997, 2001, 2003
Karongwe Game Reserve	Limpopo	24°15' S / 30°35' E	2001[b], 2002
Kgalagadi Transfrontier Park	Northern Cape	25°45' S / 20°15' E	1975[a]
Klaserie Game Reserve	Limpopo	24°15' S / 31°15' E	1991[a]
Kwandwe Private Game Reserve	Eastern Cape	33°09' S / 26°62' E	2004
Madikwe Game Reserve	North West	25°00' S / 26°12' E	1995, 1998 (2x), 2000
Marakele National Park	Limpopo	24°25' S / 27°40' E	2003
Pilanesberg National Park	North West	25°15' S / 26°85' E	1999, 2001
Shambala Private Game Reserve	Limpopo	24°19' S / 27°58' E	2002
Shamwari Game Reserve	Eastern Cape	33°27' S / 26°03' E	2003
Tswalu Kalahari Reserve	Northern Cape	27°12' S / 22°31' E	2004
uMkhuze Game Reserve	KwaZulu-Natal	27°40' S / 32°15' E	2005
Venetia Limpopo Nature Reserve	Limpopo	22°20' S / 29°20' E	1992[a], 2004

[a]Not included in analysis because of a lack of data.
[b]Excluded from analysis because all animals were recaptured 4 months after release.

Appendix 2. Survival rates of re-introduced wild dogs and their offspring over four time transitions after release or birth.

Appendix 3. Factors hypothesized to influence the survival of re-introduced wild dogs.

Parameter	Parameter value (percentages or mean ± SE)
Individual aspects	
Age of released wild dogs	Pup 24% (30/127), yearling 9% (12/127), adult 67% (85/127)
Sex of released wild dogs	Male 54% (68/127), female 46% (59/127)
Origin of released wild dogs	Wild-caught 61% (79/127), wild-caught but captive-raised 13% (16/127), captive-bred 13% (16/127), mixed (pups only) 13% (16/127)
Aspects of release areas	
Human population density (km^{-2}) in surroundings of release area	72 ± 16 (range 9–197, n = 12)
Main land use practiced in surroundings of release area	Livestock farming 50% (6/12), communal land 25% (3/12), game ranching 25% (3/12)
Public high-speed road traversing release area	17% (2/12) of release areas
Release area entirely fenced or contiguous to large protected area	92% (11/12) of release areas
Length of perimeter fence (km) around release area	115 ± 9 (range 64–160, n = 12)
Protection status of release area	Private 67% (8/12), government 33% (4/12)
Release area located at international border	8% (1/12) of release areas
Size of release area (km^2)	380 ± 75 (range 84–900, n = 12)
Number of release events per release area	1.9 ± 0.6 (range 1–8, n = 12)
Number of wild dogs released per release area	12.8 ± 3.0 (range 3–42, n = 12)
Disease aspects	
Domestic dogs occurring outside release area	75% (9/12) of release areas
Rabies vaccination programme for domestic dogs	75% (9/12) of release areas
Infectious diseases in other carnivores in release area	83% (10/12) of release areas
Rabies vaccination programme for released wild dogs	72% (13/18) of release events
Ecological aspects	
Prey (>10% in wild dog diet) density (km^{-2}) in release area	15 ± 3 (range 1–38, n = 18)
Competitor (lion and spotted hyaena) density (km^{-2}) in release area	0.13 ± 0.03 (range 0.01–0.40, n = 18)
Management reduction of competitor density in release area	75% (9/12) of release areas
Aspects of release events	
Number of wild dogs released per release event	7.1 ± 0.9 (range 2–16, n = 18)
Wild dogs resident in release area	33% (6/18) of release events
Season of release	Mating 22 % (4/18), denning 45% (8/18), other 33% (6/18)
Supplementary feeding upon release	44% (8/18) of release events
Group splits upon release	22% (4/18) of release events
Wild dogs breaking out of release area	56% (10/18) of release areas
Conservation education programme	33% (6/18) of release events
Birth of offspring upon release	94% (17/18) of release events
Aspects of social integration	
Time wild dogs kept in boma (days)	Individually 212 ± 17 (range 15–634, n = 127), together 181 ± 18 (range 15–634, n = 127), apart 6 ± 2 (range 0–86, n = 127)
Sequence of bonding wild dogs in boma	In same boma from beginning 83% (15/18), initially separated by fence 17% (3/18)
Aggression in boma	50% (9/18) of release events
Death in boma	17% (3/18) of release events
Pregnancy in boma	44% (8/18) of release events
Birth of offspring in boma	17% (3/18) of release events
Emergence of dominant pair in boma	89% (16/18) of release events
Removal of wild dogs that interfered with social integration in boma	22% (4/18) of release events
Structure of release group	Existing packs 11% (2/18), packs result of bonding groups in boma 83% (15/18), single-sex groups 6% (1/18)
Composition of release group	Naturally composed groups (existing packs/groups or packs result of bonding single-sex groups in boma) 61% (11/18), artificially composed groups (packs result of bonding non-single-sex groups in boma) 39% (7/18)
Age ratio of released wild dogs (proportion adults)	0.75 ± 0.07 (range 0.33–1.00, n = 18)
Sex ratio of released wild dogs (proportion males)	0.56 ± 0.04 (range 0.17–1.00, n = 18)