POLICY PERSPECTIVE

Standards for documenting and monitoring bird reintroduction projects

William J. Sutherland[1], Doug Armstrong[2], Stuart H. M. Butchart[3], Joanne M. Earnhardt[4], John Ewen[5], Ian Jamieson[6], Carl G. Jones[7], Rebecca Lee[8], Peter Newbery[9], James D. Nichols[10], Kevin A. Parker[11], François Sarrazin[12], Philip J. Seddon[6], Nirmal Shah[13], & Vikash Tatayah[14]

[1] Conservation Science Group, Department of Zoology, University of Cambridge, Cambridge CB2 3EJ, UK
[2] Wildlife Ecology Group, Ecology Building 624, Massey University, PB 11222, Palmerston North, New Zealand
[3] BirdLife International, Wellbrook Court, Girton Road, Cambridge CB3 0NA, UK
[4] Lincoln Park Zoo, 2001 N. Clark Street, Chicago, IL 60614, USA
[5] Institute of Zoology, Zoological Society of London, Regent's Park, London, England NW1 4RY, UK
[6] Department of Zoology, University of Otago, 340 Great King Street, P.O. Box 56, Dunedin, New Zealand
[7] Durrell Wildlife Conservation Trust, Les Augrès Manor, Trinity, Jersey JE3 5BP, Channel Islands
[8] Wildfowl & Wetlands Trust, Slimbridge, Gloustershire, GL2 7BT, UK
[9] Royal Society for the Protection of Birds, The Lodge, Sandy, Bedfordshire, SG19 2DL, UK
[10] USGS Patuxent Wildlife Research Center, 11510 American Holly Drive, Laurel, MD 0708-4017, USA
[11] The Ecology and Conservation Group, Institute for Natural Sciences, Massey University, Private Bag 102904, North Shore Mail Centre, Auckland, New Zealand
[12] Université Pierre et Marie Curie-Paris 6, UMR 7204 MNHN-CNRS-UPMC, Conservation des espèces, Restauration et Suivi des populations, Paris F-75005, France
[13] Nature Seychelles, Seychelles, Indian Ocean
[14] Mauritian Wildlife Foundation, Grannum Road, Vacoas, Mauritius, Indian Ocean

Keywords
Birds; evidence-based conservation; reintroduction; translocation.

Correspondence
William J. Sutherland, Conservation Science Group, Department of Zoology, University of Cambridge, Cambridge CB2 3EJ, UK. Tel: 01223-336686; fax: 01223-336686. E-mail: w.sutherland@zoo.cam.ac.uk

Received
23 November 2009
Accepted
9 March 2010

Editor
Andras Baldi

doi: 10.1111/j.1755-263X.2010.00113.x

Abstract

It would be much easier to assess the effectiveness of different reintroduction methods, and so improve the success of reintroductions, if there was greater standardization in documentation of the methods and outcomes. We suggest a series of standards for documenting and monitoring the methods and outcomes associated with reintroduction projects for birds. Key suggestions are: documenting the planned release before it occurs, specifying the information required on each release, postrelease monitoring occurring at standard intervals of 1 and 5 years (and 10 for long-lived species), carrying out a population estimate unless impractical, distinguishing restocked and existing individuals when supplementing populations, and documenting the results. We suggest these principles would apply, largely unchanged, to other vertebrate classes. Similar methods could be adopted for invertebrates and plants with appropriate modification. We suggest that organizations publically state whether they will adopt these approaches when undertaking reintroductions. Similar standardization would be beneficial for a wide range of topics in environmental monitoring, ecological studies, and practical conservation.

Introduction

Based on the success of evidence-based medicine, there has been recent promotion of evidence-based conservation (Sutherland *et al.* 2004). Medicine has a major advantage over conservation that the experimental subject is an individual human, so there can be numerous individuals involved in the trial and often the fates are reasonably straightforward (e.g., the individual dies or survives; the individual reports improvement or does not). By contrast, the individual data of conservation are often the fate of a population or a reserve. There is thus a particular need to bring together the information from different programs, but this is difficult if the reporting methods are inconsistent. Similarly, the process of systematic reviews (Pullin & Stewart 2006) will be greatly aided by increased standardization in reporting.

Reintroductions have been frequently used by conservationists with some impressive successes. For example, Seychelles magpie-robin *Copsychus sechellarum* was originally present on at least eight islands in the Seychelles, but had become reduced to just 12–15 birds on one island by 1965. Reintroductions, combined with a number of other techniques, had restored the population to at least 178 birds on four islands by 2009 (BirdLife International 2010). A number of high-profile New Zealand bird species, including Chatham Island black robin *Petroica traversi*, kakapo *Strigopus habroptilus* and North and South Island saddlebacks *Philesturnus carunculatus,* have been rescued from the brink of extinction through translocation and reintroduction to islands where mammalian predators such as rats and feral cats were absent or had been eradicated (Butler and Merton 1992; Lovegrove 1996; Clout & Merton 1998; Hooson & Jamieson 2003). Other examples of threatened birds showing remarkable recoveries through intensive management coupled with reintroductions are the Mauritius kestrel *Falco punctatus* (Jones *et al.* 1995), and peregrine falcon *Falco peregrinus* (Cade & Burnham 2003). Overall, a third of species for which conservation efforts were judged likely to have averted extinction during 1994–2004 had used reintroductions as part of the conservation program (Butchart *et al.* 2006). The ever increasing numbers of threatened bird species and the current debate on the merits of "assisted colonization" to mitigate the perceived impacts of global climate change (Hoegh-Guldberg *et al.* 2008; Seddon *et al.* 2009) suggest that translocation efforts will increase in the foreseeable future.

However, reintroduction success has been variable (Wolf *et al*. 1998; Fischer & Lindenmayer 2000; Soorae 2008) so there is a need to assess the factors that influence outcome (Sarrazin & Barbault 1996; Seddon 1999) at the level of reintroduction practice as a whole rather than just for well-documented single species programs, such as those cited above. This is a particularly relevant goal given the ethical implications of reintroduction failures and the limited conservation budget.

While reintroduction has proven useful and even key to the conservation of some species (cited above), only a few early projects have resulted in self-sustaining populations. In an attempt to improve success, the International Union for the Conservation of Nature (IUCN) *Guidelines for Re-introductions* were published in 1998 providing specific policy guidelines for each phase of a reintroduction project (IUCN 1998). These guidelines are now well-accepted and have proven influential in highlighting the range of issues practitioners must consider throughout a project in assisting regulatory bodies to assess project feasibility. A recent review of re-establishment projects in the African-Eurasian Waterbird Agreement area found that the more closely a project followed the guidelines the more likely that project was to be successful (Lee & Hughes 2007).

Included in the IUCN's guidelines for reintroductions is a request for postrelease monitoring and acknowledgement that this is a vital component of the reintroduction process. The IUCN guidelines were supported by numerous calls in the literature for improved outcome monitoring of reintroductions (Seddon *et al.* 2007), and although the implementation of some form of postrelease assessment is now the norm, there is no general agreement on what constitutes appropriate monitoring and no accessible (and achievable) set of monitoring guidelines available to practitioners. We suggest a set of minimum standards for monitoring and documenting reintroductions. These are not onerous. The objective is to ensure that, as a community, we collect a more complete and useful set of data on reintroductions to enable assessment of the timing and causes of both successes and failures, and that this information is easily accessible for future reference in other comparable reintroduction programs.

We recommend these standards specifically for bird reintroductions as we represent a range of ornithological organizations but we suggest that these principles would apply, largely unchanged, to other vertebrate classes. Similar methods could be adopted for invertebrates and plants with appropriate modification ideally initiated by a similar collaboration of individuals and organizations involved in reintroductions as in this article.

Of course, no one can enforce global standards. Our aspiration is that individuals, regulatory bodies and organizations will recognize their value and decide to adopt them. If so, these will become the accepted minimum standards and will cover the majority of reintroduction projects. Furthermore, the acceptance of these standards as important will provide a straightforward means to determine whether or not practitioners are following through on agreed plans. Adherence to such standards will be important to many individuals, organizations and regulatory bodies as an easy and visible means of quality control. Of course, stating that these standards will be adhered to results in a commitment to do so. It is perfectly acceptable to apply these standards to some reintroductions but for others to state beforehand that they will not be applied (e.g., where the release is in a location where monitoring is impossible).

Following Armstrong & Seddon (2008) we define "translocation" as any movement of living organisms from one area to another, and recognize three types of translocation: introduction, the movement of an organism to a location outside its historically known native range (including assisted colonization) (Hoegh-Guldberg *et al.* 2008); reintroduction, intentional movement of an organism into a part of its native range from which it has disappeared or become extirpated in historic times; and restocking, movement of individuals to build-up an existing population. There is increasing interest in the suggestion of assisted colonization—moving species in response to climate change, although this is controversial (Sutherland *et al*. 2010).

The standards

We stress that these are minimum standards and we encourage the majority of reintroductions to exceed these standards. In these principles we have aimed for the routine documentation of the success of reintroductions. In many cases it is appropriate to carry out more detailed analysis, for example, to answer specific questions (Ewen & Armstrong 2007; Armstrong & Seddon 2008). Surveying more frequently (e.g., annually) or more intensively (e.g., estimating demographic rates) has provided numerous insights into factors affecting the success of reintroductions, for example, for European griffon vultures *Gyps fulvus* (Sarrazin & Legendre 2000) or New Zealand hihi *Notiomystis cincta* (Armstrong *et al.* 2007). Our objective is to encourage studies to achieve at least the minimum standards presented here, and ideally exceed them: we do not wish to suggest that more intensive studies should reduce their effort. We suggest nine main principles. The exact actions are given as a list in Table 1.

Document planned reintroduction attempts prior to release

We are aware that many reintroductions are not documented at all and thus do not contribute to any attempts at synthesis or learning. This may be especially likely for those that are unsuccessful and might thus inflate apparent success rates. Our suggestion is that proposed reintroductions are documented prior to release, with an update when the release actually occurs or if it is cancelled. This documentation can be any time before release. This can be on an organization's website or submission to its annual report. We suggest that creating a centralized website with this function would benefit the reintroduction community as a central store of the reintroductions that have been carried out. The Reintroduction Specialist Group Oceania website provides this function for Oceania (www.massey.ac.nz/∼darmstro/nz_projects.htm).

Specify objectives of the release and subsequent monitoring

We recommend specifying the objectives of the release, and establishing clear, quantitative, measurable, taxon-specific principles for assessing project success at defined stages. Where possible, consideration should be given to carrying out and designing reintroductions to test hypotheses about required management to improve chances of success should be done. This can mean testing release methods, prolonged management, habitat management or postrelease management (as in Armstrong *et al.* 2007). There are many aspects of release methods that could benefit from experiments to examine their effectiveness. Specifics of monitoring program design will then follow directly from the specification of success criteria and manner of anticipated learning. Of course this process should be flexible to improved methodologies by justifying the change to a superior technique.

Document plans for publishing results based on follow-up monitoring before reintroduction

We recommend stating the publication plan from the start. Our suggested norm is to publish the results ideally in a peer-reviewed journal but otherwise on a website after 5 years. In some cases, such as for long-lived species, 5 years, this will not be long enough to assess the persistence of the re-established population, so further reports are recommended (see Principle 5). This should be stated in the initial proposal. If the population does not establish, these results should be submitted within a year of that observation.

Justification should be provided from the outset if the standard population estimation approach (as described below in Principle 6) is not going to be carried out. If an index of abundance or of presence or absence is measured, then this decision has to be justified at the start. It is unacceptable to state that population estimation will be done, but then change to an index or presence survey; in this case the monitoring standards have not been followed.

Document the release method in a standardized way

We suggest minimal standardized principles to describe the release method (see Table 1) so that information will be comparable across reintroduction projects. For example, analysis of Lincoln Park (USA) Zoo's Avian Reintroduction and Translocation Database data (www.lpzoo.org/artd) shows that acclimatization occurred prior to release for 42% of reintroductions and

Table 1 List of actions. Agreeing to comply with the protocol requires completing all except 4c–e and 6. Additions can be stated, for example, "The monitoring protocol was followed including 4c and 6a." Adopting the protocol requires stating the monitoring method used beforehand and then carrying it out after the standard periods.

1	Document the release prior to it taking place. This would require the following information: a) Species. b) Location. c) Proposed year of release. d) Planned monitoring. e) Planned documentation. f) Organization involved. g) Overseeing body/permitting agency. And after release h) State within 6 months of release date whether release occurred. After 5 years, or earlier if all disappear, give the reference to the publication documenting the reintroduction and the results of monitoring.
2	Consider the monitoring objectives. Consider carrying out the reintroduction as an experiment or part of an experiment to compare different introduction methods.
3	State publishing plan on website or report.
4	When publishing the minimal required information includes: Number released (including age and sex where can be determined). Date released. Whether releases are of captive or of wild-caught source. If captive, then details of origin and time in captivity. If wild, then location of source and history of source (e.g., remnant or reintroduced population itself). Location released. Distance moved and mode of transport. Whether any individuals died during capture, holding, movement—if so how many and why (postmortem reports, observations).Whether pre-release training took place, and if so, what it entailed. Whether there was any veterinary screening. What type and what were the results? Whether any veterinary treatments or vaccinations were given. Whether genetic screening took place and if so what this entailed. Whether there was any process of acclimatization, including whether it was a hard, soft, or mixed release. Whether there was supplementary feeding and, if so, what was fed, how much and how frequently. Whether there was any provision of artificial nest sites. Whether there was any predator or competitor control and, if so, what species and how were they controlled. Whether there was any post release monitoring for disease. Whether individuals were marked and, if so, how many and with what sort of mark.
5	Postrelease monitoring is essential. Our criteria are to carry out a population estimate after: One year. Five years. Optionally, but recommended for long-lived species or lengthy reintroduction programs, 10 years. Optionally, but recommended for very long-lived species or programs, 15 years. Optionally, but recommended for very long-lived species or programs, 20 years.
6	Ideally document numbers of individuals, where possible classified according to age and sex. In some cases, documenting numbers will be unrealistic and the following may be acceptable alternatives. If these alternatives are to be used then this should be stated from the start: Estimate birth and death rates (including the age-specificity of both, if possible), and use this to calculate expected population growth rate. Document breeding by finding nests. Document breeding by searching for juveniles. Document breeding by color ringing all released birds and recording whether the current birds have rings. Or record presence/absence, change in relative abundance or other indices of abundance, e.g., foraging signs, singing males, lek sites etc. Where possible also document any of the following: Breeding success Survival rate Dispersal rate Any causes of death Any causes of breeding failure
7	Distinguish age-classes and sex, if possible, in monitoring.
8	Where translocation supplements an existing population, distinguish the fate of restocked and existing individuals.
9	Document the results after the 5th year (and 10, 15, and 20th year if monitoring is extended) ideally in a journal but otherwise in a report. Add the reference or copy of the report to the website or report used for (1).

that it did not occur for 20%. In most of the remaining 38% of releases, data about acclimatization could not be located; it is likely that in most undocumented cases of acclimatization did not occur, but without these data being explicitly stated, this assumption is purely conjecture. Stating what has not been done is thus as essential as stating what has been done.

Monitor the reintroduced population at standardized time intervals

Current monitoring of reintroduction varies widely. Some of this can be for practical reasons, such as when reintroduction is to an island that is difficult to visit and can only be visited sporadically. However, this variation makes comparisons difficult. Furthermore, there can be a tendency either not to monitor at all or to monitor regularly but not document the results. We thus suggest a consistent minimum set of dates and measures. The minimum acceptable standard consists of a population estimate 1 year after the first reintroduction and again 5 years after. Where it is possible to age and sex individuals, then this should be done. For longer-lived species (i.e., average age of reproduction exceeding 5 years) or for lengthy reintroduction programs, we suggest a further survey at 10 years and for exceptionally long-lived species or long programs, sometimes another at 15 or even 20 years. Of course, continued monitoring is helpful for a range of introductions, for example, as a means of revealing demographic or genetic issues.

Monitor the reintroduced population preferably through estimating population size

Estimation of the trajectory of the population is preferable to simple assessment of presence/absence. We recommend estimating population size using an approach that deals with detection probability (e.g., mark-recapture, distance sampling, or multiple observer methods) or, in cases where detection probability approaches 1, through a direct count. Marking/banding individuals prior to release will greatly facilitate this objective. However, there are cases when providing a population estimate would not be practical; for example, if the species has sufficiently low detectability that standardized monitoring to produce meaningful population estimates is resource intensive. In such cases, other monitoring approaches, such as occupancy, are acceptable if this is stated at the start. As stated in Principle 3, these monitoring standards have not been achieved if the pre-release conditions state they will provide a population estimate but the actual monitoring is just presence/absence. As stated in Principle 3, there may be some circumstances where it is unrealistic to provide a population estimate, but this has to be stated from the start.

Distinguish age-classes and sex

The numbers of individuals in each age and sex should be given when possible, or at the very least, reporting the ratio of juveniles or unbanded birds to adults or banded birds (assuming released individuals are marked prior to release (see Principle 6). This information is useful for any population analysis and for assessing growth and viability of the population; as done for the Mauritius kestrel (Nicoll *et al.* 2004), and Laysan teal (Reynolds *et al.* 2008).

Distinguish the fate of restocked and existing individuals

Some translocations are intended to restock the population (i.e., add to existing populations) in contrast to strict reintroductions that are to unoccupied sites. Sometimes a previous reintroduction is subsequently restocked. There can be good reasons for restocking but it can both hide the changes that are occurring in the natural population and confuse the assessment of the success of the translocation. In many cases, the restocking is accompanied by changes in site management so it is difficult to determine the fate of the restocked individuals. It is thus important to distinguish the fates of the existing from restocked individuals when possible.

Make available the results, ideally through publishing, and link reference(s) to initial listing of plan

Document the full methods and results, and present them in a widely available form and ideally in a peer-reviewed journal, but otherwise in a publically available report or website. The documentation should be listed alongside the details of the planned release described in Principle 1. Thus ideally that location should give both the planned release and the subsequent results. Details should also be sent to the Avian Reintroduction and Translocation Database (www.lpzoo.org/artd).

Discussion

These standards should be reasonably straightforward for organizations to adhere to and so we hope they will be widely adopted. We also encourage funding sources, grant-making bodies, and governmental organizations responsible for approving reintroductions to consider requesting the adoption of these standards by any avian reintroduction projects supported or approved. The greatest challenge among our recommendations is monitoring after 1 and 5 years. The other important commitment is to document publicly the planned reintroduction before it commences. While these recommendations are designed for reintroductions of birds, we suggest that they could easily be applied to other vertebrate classes and would welcome adoption of a similar or identical set of principles by communities representing other taxa. The standards would probably require some modification for the monitoring of invertebrate or plant reintroductions. This is especially important as the monitoring of reintroductions of invertebrates, reptiles, amphibians and fish is far less complete than that for birds (mammals are the best documented) (Bajomi *et al.* 2010).

Standardizing methods and making the information freely available will greatly facilitate the improvement of conservation practice through enabling others in the conservation community to learn from the experience of each contributing individual and organization and improve the ability to decide when reintroductions are appropriate (Kleinman *et al.* 1994). The Oceania Reintroduction Specialist Group website (www.massey.ac.nz/~darmstro/nz_projects.htm) provides a useful working example in that it provides detail, and perhaps more importantly personnel contacts, for reintroduction projects in the Oceania region. This facilitates rapid assessment of techniques, successes and failures for particular species. Our proposal expands this model and, importantly, takes it into an international context for the wider benefit of reintroduction biology.

Ecology and conservation could benefit from standardizing documentation of conservation and management efforts in a range of program areas where there is variation in techniques. For example, we suggest that this approach would also be beneficial for the treatment (eradication or control) of invasive species, social interventions, manipulation of water quality, monitoring populations, or assessing whether a species is extinct. There is currently a somewhat arbitrary selection of measures such as: sample area, sample depth, quadrat size, observation period, sward stick area, and weight. Such standard methods would, of course, change as new methods and research becomes available. This would not, of course, preclude deviating from this methodology for good reasons.

Armstrong and Seddon (2008) described 10 key questions at the population, metapopulation, and ecosystem level to encourage a more integrated approach to the science of reintroduction biology. At the basis of all of these questions is a need to know what happens to every reintroduction attempt. This is the most productive route to improving reintroduction biology and practice and we hope that our guidelines will facilitate this advancement.

Acknowledgments

We thank an anonymous referee, A. Baldí, C. Bradshaw, and T. Cade for detailed comments. W.J.S. is funded by the Arcadia fund in the United Kingdom.

References

Armstrong, D.P., Castro I., Griffiths R. (2007) Using adaptive management to determine requirements of re-introduced populations: the case of the New Zealand hihi. *J Appl Ecol* **44**, 953–962.

Armstrong, D.P., Seddon P.J. (2008) Directions in reintroduction biology. *Trends Ecol Evol* **23**, 20–25.

Bajomi, B., Pullin A.S., Stewart G.B., Takãcs-Sãnta A. (2010) Bias and dispersal in the animal reintroduction literature. *Oryx*, doi: 10.1017/S0030605310000281.

BirdLife International (2010) Species factsheet: *Copsychus sechallarum*. Available from: http://www.birdlife.org/datazone/species/index.html?action=SpcHTMDetails.asp&sid=6638&m=0. Accessed 1 November 2009.

Butchart, S.H.M., Stattersfield A.J., Collar N.J. (2006) How many bird extinctions have we prevented? *Oryx* **40**, 266–278.

Butler, D., Merton D. (1992) *The black robin: saving the world's most endangered bird*. Oxford University Press, Oxford.

Cade, T.J., Burnham W., editors. (2003) Return of the Peregrine, a North American saga of tenacity and teamwork. *The peregrine fund*. Boise, Idaho. 394 p.

Clout M.N., Merton D.V. (1998) Saving the kakapo: the conservation of the world's most peculiar parrot. *Bird Conserv Int* **8**, 281–296.

Ewen, J.G., Armstrong D.P. (2007) Strategic monitoring of reintroductions in ecological restoration programmes. *Ecoscience* **14**, 401–409.

Fischer, J., Lindenmayer D.B. (2000) An assessment of the published results of animal relocations. *Biol Conserv* **96**, 1–11.

Hoegh-Guldberg, O., Hughes L., McIntyre S. *et al*. (2008). Assisted colonization and rapid climate change. *Science* **321**, 345–346.

IUCN. (1998) Guidelines for re-introductions. Prepared by the IUCN/SSC Re-introduction Specialist Group. IUCN, Gland, Switzerland and Cambridge, UK.

Hooson, S., Jamieson I.G. (2003) The distribution and current status of New Zealand Saddleback *Philesturnus carunculatus*. *Bird Conserv Int* **13**, 79–95.

Jones, C.G., Heck K.W., Lewis R.E., Mungroo Y., Slade G., Cade T. (1995) The restoration of the Mauritius kestrel *Falco punctatus* population. *Ibis Supplement* **1**, 173–180.

Kleinman, D.G., Stanley Price M.R., Beck B.B. (1994) Criteria for reintroductions. Pages 288–303 in P.J.S. Olney, G.M. Mace, A.T.C. Feistner, editors, *Creative conservation: interactive management of wild and captive animals*. Chapman and Hall, London, UK.

Lee, R., Hughes B. (2007) Review of waterbird re-establishment in the AEWA Area. Document number AEWA/MOP 4.11. Available from: http://www.unep-aewa.org/meetings/en/mop/mop4_docs/meeting_docs_pdf/mop4_11_re_establishment_review.pdf. Accessed 23 July 2009.

Lovegrove, T.G. (1996) Island releases of saddlebacks Philesturnus carunculatus in New Zealand. *Biol Conserv* **77**, 151–157.

Nicoll, M.A.C, Jones C.G., Norris K. (2004) Comparison of survival rates of captive-reared and wild-bred Mauritius kestrels (*Falco punctatus*) in a re-introduced population. *Biol Conserv* **118**, 539–548.

Pullin, A.S., Stewart G.B. (2006) Guidelines for systematic review in conservation and environmental management. *Conserv Biol* **20**, 1647–1656.

Reynolds, M.H., Seavy N.E., Vekasy M.S., Klavitter J.L., Laniawe L.P. (2008). Translocation and early post-release demography of endangered Laysan teal. *Anim Conserv* **11**, 160–168.

Sarrazin, F., Barbault R. (1996) Reintroduction: challenges and lessons for basic ecology. *Trends Ecol Evol* **11**, 474–478.

Sarrazin, F., Legendre S. (2000) Demographic approach to releasing adults versus young in reintroductions. *Conserv Biol* **14**, 488–500.

Seddon, P.J. (1999) Persistence without intervention: assessing success in wildlife re-introductions. *Trends Ecol Evol* **14**, 503.

Seddon, P.J., Armstrong D.P., Maloney R.F. (2007) Developing the science of reintroduction biology. *Conserv Biol* **21**, 303–312.

Seddon, P.J., Armstrong D.P., Soorae P. *et al*. (2009) The risks of assisted colonization. *Conserv Biol* **23**, 788–789.

Soorae P., editor. (2008) *Global re-introduction perspectives: re-introduction case studies from around the globe*. IUCN/SSC Re-introduction Specialist Group, Abu Chabi, UAE.

Sutherland, W.J., Clout, M., Côté I.M. *et al*. (2010) A horizon scan of global conservation issues for 2010. *Trends Ecol Evol* **25**, 1–7.

Sutherland, W.J., Pullin A.S., Dolman P.M., Knight T.M. (2004) The need for evidence-based conservation. *Trends Ecol Evol* **19**, 305–308.

Wolf, C.M., Garland T. Jr., Griffith B. (1998) Predictors of avian and mammalian translocation success: reanalysis with phylogenetically independent contrasts. *Biol Conserv* **86**, 243–255.