# Translocation of non-threatened species for 'humanitarian' reasons: what are the conservation risks?

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A consignment of reptiles and arachnids, in transit from Mozambique to the USA, made headlines recently when it was confiscated at Johannesburg International Airport by the SPCA, an animal welfare organisaton. Although the required permits appeared to be in order, a number of the animals had died or were inappropriately packed (according to the SPCA). This negligence led to the confiscation of the animals by the organisation. Part of the consignment consisted of spiders and scorpions. After the necessary legal steps, the SPCA obtained possession of the animals, and following consultation with experts (including Mpumalanga Nature Conservation), the spiders and scorpions were released in the vicinity of Hoedspruit in Mpumalanga (former eastern Transvaal). The rationale behind this decision was that the same species were recorded from the area and so were native to that region. This event was soon followed by the release of several hundred reptiles (supposedly collected in Mozambique) in Zimbabwe. Many of the lizards were Platysaurus spp., a genus of rupicolous lizards that are thought to be poor dispersers,[1] limiting their opportunity for genetic exchange beyond isolated populations. Historical isolation, therefore, potentially increases the risk of numerous adverse affects (discussed below), if genetic exchange with local populations were to occur.

Translocation (broadly defined as when an animal is moved from one location to another;[2] encompassing relocation, repatriation, introduction, reintroduction and augmentation) is a conservation strategy that has recently come under scrutiny mainly because the same problems that plague natural populations impede newly bolstered populations.[3] As a consequence, the success rate of these projects is often low. A review of mammal and bird translocation programmes reported a 44% success rate.[4] In South Africa, a recent study reported a success rate of 53% for ungulate translocations in national parks.[5] A corresponding rate of 19% was reported for amphibians and reptiles (worldwide).[6] The success of these strategies is thought to be dependent on a variety of environmental and genetic factors.[2,6] However, the release of spiders and scorpions in Hoedspruit and reptiles in Zimbabwe appeared to be motivated more by 'humanitarian' than conservation concerns. This article is concerned with the possible effect of such humanitarian releases on local populations and ecosystems as opposed to the survival of the released animals. In particular, if non-threatened species are involved, is translocation a viable option at the risk of adversely affecting established local populations and ecosystems?

The application of molecular techniques to systematic biology has resulted in the discovery of many cryptic species. For example, Highton's[7] work on plethodontid salamanders revealed that the nominate race actually consisted of 16 species! The message from this and other studies in molecular systematics is that there are many more species than what meets the eye. Care must, therefore, be taken during translocation to ensure that cryptic species are not introduced into an area. Also, within a species there is often considerable geographic variation that may or may not be expressed phenotypically. This may be the result of genetic drift or selective forces.[2] By translocating animals from one part of a species' range to another, you are allowing genetic exchange to take place that otherwise would not. If the populations are genetically divergent, deleterious genetic effects may result from genetic exchange. This is outbreeding depression and the end result is a reduction in fitness.[2,8,10]

If you consider two populations of the same species that are geographically distant and which experience slightly different environmental conditions, they may have different co-adapted gene complexes as a result of local adaptation. By allowing genetic exchange these complexes may be broken up through hybridization, resulting in reduced fitness.[2,8,10] In so doing, we may also be intervening in the evolutionary process.[9] Numerous studies have documented a breakdown in co-adapted gene complexes and a concomitant fitness reduction for a variety of animals, including insects.[8,10] One of the best-known examples comes from Europe. When the ibex (*Capra ibex ibex*) became extinct in Czechoslovakia due to over-hunting, ibex were successfully translocated from neighbouring Austria. Some years later two other subspecies of ibex were translocated to the same herd, from Turkey and Sinai. The result was fertile hybrids that rutted in autumn instead of winter, thereby producing offspring in the coldest part of the year. The unfortunate outcome was the population's extinction.[11]

Other negative effects of translocation include aberrant behavioural patterns displayed by released individuals compared to natives,[2,12] competitive (ecological) effects on native species,[9,13] initiation of interspecific hybridogenetic populations (that may compete with local low-polymorphic populations),[14] disease transmission,[15] and increased incidence of disease due to the stress of translocation.[16] Aberrant behaviour or social dysfunction may be especially problematic for group foragers or species that form breeding congregations. Social dysfunction is thought to have contributed to the extinction of the Carolina parakeet (*Conuropsis carolinensis*), the passenger pigeon (*Ectopistes migratorius*), and the heath hen (*Tympanuchus cupido cupido*) in the US.[17] Examples of negative ecological effects due to translocations are numerous. One well-documented translocated species heavily impacting local fauna is the North American bullfrog, *Rana catesbeiana*.[18] An example of hybridogenesis threatening local populations occurs in Iberian water frogs. The genetic structure of low-polymorphic *Rana perezi* is threatened by the creation of hybridogenetic populations of *R. ribidunda–R. perezi*, as a result of translocated *R. ribidunda*.[14] Little is known about disease transmission in reptiles and arthropods such as spiders and scorpions, and this may not be a concern, but it is worthy of mention because it has been documented for other organisms involved in translocations. In the case of the North American desert tortoise (*Xerobates agassizii*), a species frequently translocated, highly contagious upper respiratory disease syndrome was at least partially responsible for federal protection of populations in the western Mojave Desert.[6] Also, beavers (*Castor fiber*) translocated to the Netherlands suffered high mortality from infectious diseases brought on by the stress of being moved.[16]

Traditionally, translocations have been perceived by the general public (and some conservationists) as successful and 'humane' conservation strategies.[6] Although there are certainly many success stories, they are exceeded by the number of failures.[6] Much of this is due to a lack of understanding of the complexity of factors influencing an organism's success in a particular environment. The possible deleterious effects of such translocations must always be considered before implementation of a translocation programme. In the case of critically endangered species, decisions may have to be made with a minimal amount of data and may require a certain amount of intuition. However, this should not be the case for non-threatened species, where the possible long-term effects on an ecosystem or local population should outweigh the well being of a relatively small number of displaced individuals. In the absence of opportunities to return such animals to their places of origin, maintaining them in captivity for education purposes and preventing further breeding may be preferable.

Translocations should be carried out by qualified scientists following a standard protocol. (Recently published translocation guidelines are provided in Dodd and Seigel,[6] and Griffith *et al.*[4]) At a minimum, such a protocol should include meticulous documentation of the sex, condition, date of release, and origin of all animals involved in the translocation. If possible, individuals should be tagged, thereby allowing measurement of survival. Provision must be made for a thorough risk assessment prior to translocation, as well as a monitoring programme subsequent to release. Prior to release, limiting factors should be identified and controlled. Predictive models for translocation success based on limiting factors have been developed,[4] and could be informative in evaluating the potential success of a translocation. Such a protocol would not only increase the likelihood of a successful translocation, but in unsuccessful attempts may shed light on the causes of failure. Understanding the factors associated with failed translocations has been hampered by a lack of monitoring programmes.[5,6]

Translocations will in most cases have an effect (generally negative) on the native populations into which the organisms are released. Therefore, a planning stage preceding translocation is imperative. In this sense the equivalent of an environmental impact assessment (EIA) is required before good justification could be offered for moving wild animals or plants. The Environmental Conservation Act (with recent draft amendments) could be used to provide guidelines that would place translocations in the realm of such environmental impact assessments. The movement of wildlife needs to be added to the list of activities requiring EIA according to the above act. This would encourage group decision making and the consultation of outside experts. In an era of global environmental instability and mass extinction of species, the formulation of a sound protocol for translocations is critical and implementation of the environmental act could play a large part in achieving this end.

In summary, I have listed the possible negative effects of translocations previously reported in the scientific literature. I argue that translocations may have an important role to play in the conservation of endangered species, but due to the considerable risks involved, alternatives for non-threatened species removed from their native habitat should be sought. The ramifications for all translocations should be evaluated following sound scientific procedures, observing a set protocol, and translocations should not be motivated solely by emotional considerations. The equivalent of an environmental impact assessment with well-defined criteria may provide a foundation for a standard translocation protocol.

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