frontiers | Frontiers in Conservation Science

EDITORIAL
published: 25 April 2022
doi: 10.3389/fcosc.2022.888125

Editorial: Animal Behavior After Translocation Into Novel Environments

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Keywords: conservation behavior, exploration-exploitation, conservation translocations, HIREC, captive breeding

Editorial on the Research Topic

Animal Behavior After Translocation Into Novel Environments

Imagine the following scenario: you have been invited to a conference in a foreign country, where you have never visited before and do not speak the language. A few hours after arriving at your hotel, you are abducted by a group of strangers. As you regain consciousness, you find yourself alone in a completely unfamiliar city. You realize that in order to survive, you urgently need to find a safe place and some food, and to evade the bands of marauding criminals that roam this part of the city.

While this scenario sounds like the plot of a typical scary movie or video game, it might also describe (albeit in an anthropomorphized fashion) the experience that translocated animals go through as they are released into a novel environment which might be vastly different to any environment they have ever known. Conservation translocation, the deliberate movement of organisms from one site with release into another (IUCN/SSC, 2013), is a commonly applied conservation tool aimed at recovering threatened populations, reducing extinction risk, or restoring ecosystem functions (Seddon et al., 2014; Hoffmann et al., 2015). Nevertheless, despite the popularity of this approach, translocating animals and releasing them into the wild is a challenging ordeal that often fails (Berger-Tal et al., 2020). Considering the disturbing scenario that we outlined above, the challenges of translocation projects might become clearer—the success of a translocation project depends on the ability of the released individuals to survive and later also to reproduce in an unfamiliar environment.

These challenges make the study of animal behavior in novel environments crucial to the success of most future conservation translocation projects (Berger-Tal and Saltz, 2016). By understanding how animals behaviorally respond to novel environments and whether these reactions are adaptive, researchers can design effective solutions that could increase translocation success. Such solutions are most crucial during the establishment phase of the translocation (Armstrong and Seddon, 2008), when survival, reproduction and dispersal of the released individuals closely depend on their responses their new environment. Knowledge on how animals behave in novel environments may help managers prior to the release, by helping them choose specific individuals for release, guiding them in the design of the captive environment, or directing them toward the appropriate pre-release behavioral training protocol that will increase the chances that the released animals will succeed in the new environment (Shier, 2016; Blumstein et al., 2019; Greggor et al., 2021). Alternatively, knowledge of animal behavior could help design effective solutions that could be implemented after the release, such as making modifications to the release site, release protocols, or

OPEN ACCESS

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Specialty section:
This article was submitted to Animal Conservation, a section of the journal Frontiers in Conservation Science

Received: *02 March 2022*
Accepted: *05 April 2022*
Published: *25 April 2022*

Citation:
Berger-Tal O, Saltz D, Moseby KE and Seddon PJ (2022) Editorial: Animal Behavior After Translocation Into Novel Environments. Front. Conserv. Sci. 3:888125. doi: 10.3389/fcosc.2022.888125

the post-release conditions (Bell, 2016; Efrat et al., 2020; Resende et al., 2021). Detailed monitoring of released individuals might indicate the need for further adjustments to the release site or to the release protocol, since acclimatization to the new environment can take anywhere between several weeks to well over a year (Poirier and Festa-Bianchet, 2018; Bannister et al., 2020).

The articles in this Research Topic tackle different aspects of the behavioral responses of animals translocated to novel environments. They apply very different approaches and methodologies to better understand how animals cope (or fail to cope) with novel environments, and the ways in which we can harness this understanding to improve conservation translocation projects. Maor-Cohen et al. showed that reintroduced Persian fallow deer, *Dama mesopotamica*, change their habitat preferences over time as they become familiar with the novel landscape. They also found that individual variation in habitat selection can take a few years to be expressed because the initially perceived high risk in the months following the release overshadows any other individual preferences. Working on a completely different system, Picardi et al. had similar findings, showing that temporal dynamics of post-release habitat selection in translocated greater sage-grouse, *Centrocercus urophasianus*, can emerge in some individuals but not in others, highlighting the importance of accounting for both individual variation and the time since release in order to detect habitat selection patterns in translocated animals. The results of these two studies emphasize the central role that individual differences in behavior have in determining translocation success, which reflects a wider understanding within the field of conservation science, i.e., that measurements of inter- and intra-individual differences within populations should be incorporated into conservation and management programs in order to enhance their efficacy and increase their success rate (Merrick and Koprowski, 2017).

Goldenberg et al. studied the movement of African savannah elephants, *Loxodonta Africana*, calves following their release into a fenced wildlife sanctuary in northern Kenya, and found that the released calves tended to use fewer sites than their resident conspecifics, but that social context was an important driver of exploration in these individuals. Sociality was of key concern also in the study of Kaczensky et al. who investigated the movement patterns of kulan, *Equus hemionus kulan*, translocated to a vast novel habitat with no resident conspecifics, in the Torgai region of Kazakhstan. The authors found that the fission-fusion dynamics and low movement correlation within kulan groups increases the risk that the individuals will lose contact with each other and lead to translocation failure. Doden et al. studied the movement of translocated American beavers, *Castor canadensis*, and showed that day-to-day activities, such as foraging and resting, were largely unaltered by translocation, but translocated beavers exhibited coarse-scale movement behaviors most similar to dispersal by resident subadults.

Undin et al. studied the post-release mating behavior of North Island brown kiwi, *Apteryx mantelli*, on Ponui Island, New Zealand, and the implications for genomic admixture. Using genomic tools, the authors found that the kiwi did not mate randomly, but rather preferred individuals different than themselves, reducing inbreeding and increasing genetic variability in this translocated population. Lee et al. studied vigilance and foraging behavior in a cohort of captive-bred ʻAlalā, *Corvus hawaiiensis*, after their release to the Island of Hawai'i. They found that the vigilance of the birds overall increased over time since release, but that as group size increased, both vigilance and foraging decreased. They also found that the feeders used to provide supplementary food for the birds might have inadvertently increased the birds' susceptibility to predation. Dixon-MacCallum et al. presented taxidermic mounts of mammalian predators and non-predators to Vancouver Island marmots, *Marmota vancouverensis*, that were either wild-caught, or captive-born. They found that after only two generations in captivity, marmots begin losing their ability to discriminate predators from non-predators, suggesting that pre-release predator-recognition training might be needed to increase the survival of translocated individuals of this critically endangered species.

Finally, two studies in our Research Topic applied a theoretical or conceptual framework to the issue of animal behavior in novel environments. Saltz and Getz applied optimal stopping theory—a mathematical theory addressing the problem of when to stop a current activity and take a particular action so that expected net rewards are maximized—to the case of animals in a novel environment. Specifically, the authors asked "when should an animal stop exploring a novel habitat and "settle down" within a defined home range?". They provide a set of related predictions that are testable within the context of translocation projects. Hunter-Ayad et al. proposed two strategies for approaching and managing novelty in the context of conservation translocations. The conservative strategy, characterized by the avoidance and removal of novel conditions as much as possible, is best used for translocations of highly threatened species for which ensuring post-release survival is a priority. The extrapolative strategy deliberately allows exposure to novel conditions and monitoring outcomes to increase understanding of a species' ecology, which suits species that are in recovery and species facing novel and emerging threats that may require non-traditional translocations, such as assisted colonizations.

While our Research Topic focuses on conservation translocations, rapid anthropogenic changes to the environment makes the encountering of novel environments the rule rather than the exception for many species of animals, translocated or otherwise. Thus, the insights coming from this special topic go far beyond the practice of conservation translocations and might promote better conservation of wildlife in a rapidly changing world.

AUTHOR CONTRIBUTIONS

The editorial was drafted by OB-T. All authors contributed to the editorial and approved the submitted version.

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Conflict of Interest: The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.