Institution: University College London

Unit of Assessment: 5 - Biological Sciences

Title of case study: Empowering effective conservation translocations for saving species

Period when the underpinning research was undertaken: 2000 - 2020

Details of staff conducting the underpinning research from the submitting unit:

Name(s):	Role(s) (e.g. job title):	Period(s) employed by submitting HEI:
John Ewen	Senior Research Fellow	August 2004 - present
Nathalie Pettorelli	Senior Research Fellow	April 2006 - present
Stefano Canessa	Post Doctoral Research Assistant	June 2015 - September 2016

Period when the claimed impact occurred: 1 August 2013 - 31 December 2020

Is this case study continued from a case study submitted in 2014? N

1. Summary of Impact

Although a widely used conservation management action for >1,300 species worldwide, conservation translocations (moving endangered species from one site to another for conservation) have a poor success record. To address this, researchers at the Institute of Zoology (IoZ) developed a programme of work to identify best practice methods for the management of conservation translocation programmes. These methods were implemented via review of International Union for Conservation of Nature (IUCN) conservation translocation guidelines, development of IUCN conservation translocation practitioner training and through policy and management initiatives adopted by conservation NGOs and governments globally. As a result, there have been demonstrable improvements for focal species (critically important endangered species) across the world, including IoZ playing a critical role in leading the recovery of four bird species: New Zealand's hihi (adding >200 to a global population of 1000-3000), Australian Regent honeyeaters, Mauritius parakeets and olive white-eyes.

2. Underpinning research

Conservation translocations (defined as 'deliberate movement of organisms from one site for release in another intended to yield a measurable conservation benefit' by the IUCN in 2013) are an increasingly necessary conservation tool. However, despite a few well-publicised success stories, most conservation translocations fail. If global biodiversity recovery is to be achieved, improving conservation translocation success is imperative.

IoZ research undertaken by Taylor (Ewen's NERC/DTP Student between 2014 and 2018) found that, despite 20 years of the applied science of reintroduction biology, the discipline has largely failed to support conservation translocations because of a mismatch between species management needs and scientific interests [R1], leading to the production of interesting, yet not always useful, science. In response to this, IoZ developed a research programme aimed at delivering evidence-based solutions to management issues identified by practitioners and associated with animal translocations. This approach ensured that IoZ research met end users' expectations, including governments and NGOs, and directly informed management decisions. Some specific examples from IoZ research include:

New Zealand (NZ) hihi translocations
The hihi is an endangered NZ forest bird which had become restricted to a single offshore island; since 1980 an ongoing recovery program has aimed to increase its range and numbers, through reintroduction. Often conservation translocations involve supporting the animals after their release, for example supplementary feeding – but this is often carried out without critical evaluation of how much benefit these measures provide. IoZ researchers provided this critical evaluation. They used monitoring data from 1991 to 2010 to quantify population demographic benefits of supplementary feeding and projected these into the future under different feeding regimes (research carried out by Chauvenet, Ewen's AXA-funded PhD Student between 2009 and 2012) [R2]. Furthermore, using population monitoring data from 1995 to 2015, Ewen et al. built a model to evaluate three management alternatives, including no further translocation and translocations of 15 additional females (from the only possible source population) in either 2015 or 2016. The fundamental objectives were to maximize the number and persistence of female hihi in the new location, minimize the impact on the source population, and minimize costs. Their analysis, carried out between 2016 and 2018, showed that no further translocation was the rational choice for an establishing population [R3].

Mauritius (Echo) parakeet disease management
An outbreak of beak and feather disease virus in Mauritius parakeets in 2005 has led to major changes in how this reinforced wild population has been managed ever since. Using an experimental approach spanning three breeding seasons (2013 to 2014 and 2015 to 2016) IoZ researchers quantified the efficacy of chemical hygiene protocols of nest sites that had been in place since the outbreak (work led by Fogell, Ewen's NERC/DTP Student between 2015 and 2019). IoZ researchers showed that while management reduced prevalence of beak and feather disease virus it also unintentionally reduced breeding success (the fundamental objective for management), leading to an evidence-based change in nest site management [R4].

Mauritius olive white-eye supplementary feeding
Post-release population growth of the critically endangered Mauritius olive white-eye had been aided by supplementary feeding. However, the success of feeding resulted in demand for food that overtook management capacity. In turn, managers feared that changing to a less intense feeding regime would cause population declines. IoZ research combined a field experiment (undertaken between 2013 and 2015) with decision support analysis to quantify the risks and assist in rational decision making, resulting in an evidence-based change to a less intensive, less costly feeding regime that did not cause population declines. In 2020, four years after the experiment, the population was continuing to grow and costs had been contained, matching predictions almost exactly [R5] (selected Feature Paper for the upcoming issue of the journal).

Australian Regent honeyeater nest predator management
Regent honeyeaters are critically endangered, with an estimated population of less than 400 mature birds. An ongoing reinforcement program is in place using captive reared birds. IoZ research found that the reproductive success of released birds was very low due to predation. As part of the research, IoZ researchers led a decision process for identifying and selecting a perceived best way to manage predator pressure (undertaken by Taylor, Ewen's NERC/DTP Student between 2014 and 2018) [R6]. This research showed how risk aversion (stemming from the wish not to worsen an already perilous species status) and uncertainty makes decisions difficult, but structured thinking helps compare and select management options, subsequently adopted by the recovery group.

3. References to the research

IoZ staff and student contributions in bold. Altmetrics provided given recentness of most publications listed. Citations given for outputs pre-2019.

[R1] **Taylor, G., Canessa, S.,** Clarke, R.H., Ingwersen, D., Armstrong, D.P., Seddon, P.J. & **Ewen, J.G.** (2017). 'Is reintroduction biology and effective applied science? Trends in Ecology and Evolution' **32**, 873-880. DOI: https://doi.org/10.1016/j.tree.2017.08.002 (This systematic review includes primary data analysis based on data extracted from reviewed articles. Citation number: 56, Percentile relative to 15,000,000 output across all sources: 93rd percentile)

[R2] **Chauvenet, A.L.M., Ewen, J.G.,** Armstrong, D.P., Coulson, T., **Blackburn, T.M.,** Adams, L., **Walker, L.K.** & **Pettorelli, N.** (2012). 'Does supplemental feeding affect the viability of translocated populations? The example of the hihi'. *Animal Conservation*. **15**, 337-350. DOI: https://doi.org/10.1111/j.1469-1795.2012.00522.x (Citation number: 42, Percentile relative to 12,420,000 outputs across all sources: 73rd percentile)

[R3] Panfylova, J., **Ewen, J.G.** & Armstrong, D.P. (2019). 'Making structured decisions for reintroduced populations'. *Conservation Science and Practice.* **1** (10). DOI: http://doi.org/10.1111/csp2.90 (Percentile relative to 15,807,000 outputs across all sources: 48th percentile)

[R4] **Fogell, D.J.,** Groombridge, J.J., Tollington, S., Canessa, S., Henshaw, S., Zuel, N., Jones, C.G., Greenwood, A. & **Ewen, J.G.** (2019). 'Hygiene and biosecurity protocols reduce infection prevalence but do not improve fledging success in an endangered parrot.' *Scientific Reports* **9**,4779. DOI: https://doi.org/10.1038/s41598-019-41323-w (Percentile relative to 15,791,000 outputs across all sources: 96th percentile)

[R5] Ferrière, C., Zuël, N., **Ewen, J.G.**, Jones, C.G., Tatayah, V. & **Canessa, S.** (2020). 'Assessing the risks of changing ongoing management of endangered species'. *Animal Conservation.* DOI: https://doi.org/10.1111/acv.12602 (Percentile relative to 16,363,000 outputs across all sources: 94th percentile)

[R6] **Canessa, S., Taylor, G.,** Clarke, R.H., Ingwersen, D., Vandersteen, J. & **Ewen, J.G.** (2019). 'Risk aversion and uncertainty create a conundrum for planning recovery of a critically endangered species'. *Conservation Science and Practice.* **2** (2), e138. DOI: https://doi.org/10.1111/csp2.138%20 (Percentile relative to 15,432,000 outputs across all sources: 92nd percentile)

4. Details of the impact

IoZ works to promote best practice conservation translocations, with impact falling into three main areas: the recovery of endangered focal species (animal species that provide an essential ecological function); capacity building through IUCN training; and influencing the adoption of IUCN guidelines into policy.

Focal species recovery
IoZ research has led to population recovery of multiple endangered species globally:

Hihi (stitchbird): IOZ played a critical role in the recovery of NZ's endemic hihi alongside collaborators at Massey University. Hihi had become restricted to a single small offshore island for more than a century before early success in reintroduction to Kapiti Island in 1991 [R2]. Based on the findings that population vital rates can be improved via supplementary feeding [R2] all reintroduction sites are fed but closely monitored to refine feeding management decisions [S1]. IoZ research set methods for assessing monitoring data for making decisions on releasing birds [R3)]. These approaches were used to establish three new populations between August 2013 and December 2020, growing the number of populations to seven and spreading hihi into two new mainland regions within their historic range after an absence of more than a century. IoZ research has been used to define national management protocols requested by the NZ government [S1]. Ewen et al.'s methods of modelling projections of both source and destination populations [R3] have been

used to give permission for or against translocation [S2], as evidenced by communication from NZ Department of Conservation's Director General: "*We are so impressed with the work you do and the increasing recovery of these remarkable birds.*" [S3]. Alienor Chauvenet, the IoZ PhD student who carried out the research [R2] was awarded a RSPB Conservation Science Award 2014 for outstanding PhD thesis in conservation science, with the RSPB judges commenting: *"Alienor's thesis was chosen because it has already had a tangible impact on the conservation of a threatened species, and will contribute to the conservation of many others in future."* [S3].

Mauritius parakeet: Once the world's rarest parrot, with 8 to 12 individuals in 1987, the Mauritius parakeet now numbers about 400-450 mature individuals. The work of IoZ researchers, alongside collaborators at the University of Kent, showing that chemical treatment of nest boxes reduced breeding success [R4], resulted in the Mauritius Wildlife Foundation (MWF, an in-country NGO) discontinuing chemical treatment of nest boxes in 2017, a process that had been in place for over a decade. This improved parakeet breeding success by 5% [R4], as well as removing a resource intensive component of population management [S4]. Similarly, IoZ work done with MWF predicting cheaper management with equal population growth in the critically endangered Mauritius olive white-eye (the rarest bird species in Mauritius; 191 to 327 mature individuals) [R5] resulted in the MWF reducing management effort involving supplementary feeding in 2015. MWF's Conservation Director stated that "*this research gave us the evidence needed to change from twice daily feeding with expensive imported nutritional supplements to single daily feeds with a much cheaper and locally produced food, cutting our costs by more than half*" [S4]. In both cases there has been a substantial ease in the workload and no compromise on the recovery of either species.

Regent honeyeater: In Australia, IoZ and Monash University research on the critically endangered Regent honeyeater (350 to 400 mature individuals remaining) quantified the predicted outcome of alternative nest protection actions [R6]. This research was used by the species recovery team to select and apply new nest protection measures using tree collars in 2019. Birdlife Australia's National Regent Honeyeater Recovery Coordinator stated: "*Gemma and the IoZ team helped us work through a complicated choice to find the best balance for action and risk for us*") [S5].

Capacity building through IUCN training

Capacity building can allow faster uptake of best practice. In 2016, the Chair of the IUCN Conservation Translocation Specialist Group (CTSG) engaged IoZ to lead on developing an IUCN CTSG practitioner training course [S6], which features worked examples including [R1], [R2], [R3], [R4], [R6]. This four-day course has been running annually since 2016 and has trained 110 practitioners from 27 countries to date (including 26 practitioners from developing countries). Feedback from the course has been excellent, for example, one participant from Natural England said: *"I really enjoyed the course and sat through most of it thinking my job would be so much easier if people applied the methods discussed at least to some extent."* Another from The Nature Conservancy stated: *"I am so grateful to have had the opportunity to participate in that training. It was one of the best investments of time in that kind of thing I've made in memory. It was really, really good."* [S6].

Ongoing contact with course alumni has also demonstrated the enduring impact of the training. For example, in release planning of the extinct-in-the-wild Guam kingfisher (sihek). The Coordinator of Bird Programmes at Guam's Department of Agriculture notes that "*It is amazing to say that sihek releases will take place within the next one to two years. Had I not attended the training in 2016, there is no doubt this project would still be stuck.*" (Course alumni Hawaii 2016; [S7]). Also, for the recovery planning of NZ's rarest breeding bird, the tara-iti, a technical advisor from NZ's Department of Conservation states: "*We are now able to move forward with a robust recovery strategy for tara iti, due to Dr Ewen's work, the approach promoted by the IUCN training course and work showcased from the group at the Institute of Zoology*" (course alumni Chicago 2018; [S8]). Both projects follow methodologies

taught in the course materials including direct comparison of alternatives as stated in [R1] and decision support methods as detailed in [R3] and [R6].

Influencing the adoption of IUCN guidelines into policy

Success stories from IoZ research in [R2], [R3], [R4] and [R5] attracted wider sector interest from NGOs and policymakers via their exposure in IUCN training. This led Ewen to be invited to the British and Irish Association of Zoos and Aquariums (BIAZA) Reintroduction Advisory Group, where he drafted the BIAZA Policy on Conservation Translocations. This policy was signed off by the BIAZA council in March 2019, providing best practice of translocation to all BIAZA zoos and aquariums in Britain and Ireland [S9]. In addition, Ewen was invited as a sounding board member for Natural England's 'Code and Good Practice Guidance for Reintroductions and Conservation Translocations', where the Principal Specialist for Species Protection at Natural England noted: "*his key recommendation has been to encourage conservation translocation decisions based on an iterative approach judging alternatives against clearly defined objectives"* as outlined in [R1] [S10].

5. Sources to corroborate the impact

[S1] Ewen, J.G., Armstrong, D.P., McInnes, K., Parker, K.A., Richardson, K.M., Walker, L.K., Makan, T.D. & McCready, M. (2018). 'Hihi best practice guide'. Department of Conservation, Wellington, New Zealand. Download here: www.hihiconservation.com/wp-content/uploads/2019/03/Hihi-Best-Practice-Guide-July-2018-small.pdf

[S2] Hihi Recovery Group Meeting minutes showing management decision justification

[S3] Email from Director-General Department of Conservation; New Zealand
RSPB conservation science award: https://www.rspb.org.uk/our-work/conservation/centre-for-conservation-science/conservation-science-awards/2014/

[S4] Letter from Conservation Director, Mauritius Wildlife Foundation, Mauritius

[S5] Email from Birdlife Australia

[S6] Letter from Chair IUCN SSC Conservation Translocation Specialist Group.

[S7] Email from Coordinator of Bird Programs, Guam Division of Aquatic and Wildlife Resources, Department of Agriculture, Guam.

[S8] Email from Department of Conservation, New Zealand about Tara-iti planning.

[S9] BIAZA email and Conservation Translocation Policy

[S10] Email from Natural England