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One Health in translocation actions: epidemiology at the hybridised European wildcat – domestic cat interface

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Hybridisation between wild and domestic species poses a serious challenge to conservation management and can lead to extinction, through genetic introgression. Additionally, during interbreeding, infectious disease transmission can occur. However, the link between hybridisation and disease transmission has historically been neglected. In Scotland, the European wildcat (Felis silvestris) is critically threatened by hybridisation with the domestic cat (Felis catus). Complex introgression has resulted in a 'hybrid swarm', a genetic continuum between the wild and domestic species. As a consequence, the wildcat population in Scotland was considered non-viable, without restoration through captive breeding and release. To strategically shape and safeguard these required translocation actions, and on the basis that the hybridised population might act as a bridge for disease transmission between the two species, a One Health approach to the wildcat – domestic cat interface became crucial. A comprehensive health assessment - including wildcats, domestic cats, hybrids and their environment -, combined with genetic research, was the foundation to inform the disease risk analysis and mitigation practices now implemented by the 'Saving Wildcats' translocation project. It was concluded that the 'hybrid swarm' may now be functioning as a single epidemiological unit: the interactions between wildcats and domestic cats that resulted in the genetic continuum, may also have allowed a more homogenous transmission of infectious agents. This provides a new insight into the epidemiology of hybridised populations. Ultimately, this integrative approach could be applied to inform targeted conservation of other species, where hybridisation and parallel infectious disease transmission are considered potential threats.

The usefulness of pre-translocation habitat suitability analyses for reintroductions of critical weight range mammals

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Biography:
Georgie is an ecologist with Australian Wildlife Conservancy. She coordinates the science program at Mt Gibson Sanctuary, the site of a major reintroduction program. Georgie is responsible for the translocation of threatened species and coordinates a team of ecologists who conduct monitoring and research.

Australian Wildlife Conservancy's Mt Gibson Sanctuary is the site of a mammal restoration project involving translocations of nine critical weight range mammals into a feral predator-free fenced area. A major component of justifying and planning for these conservation translocations was determining whether the habitat of the destination environment was suitable. However, Australian mammals have contracted from most of their historical ranges and therefore the habitat assessments were based on the species' refugial range. An annual survey using remote cameras has been used to monitor changes in site occupancy and activity in the reintroduced species at Mt Gibson since 2018. The data from this camera array has allowed us to determine which habitat types were actually used by the reintroduced species. Habitat use by four of the five species effectively monitored via the camera array did not follow predicted habitat

suitability. These results suggest that habitat suitability assessments based on a species' refugial range may have limited utility for decisions on whether a reintroduction to a particular area should proceed. Rather, information on historical ranges, prior to European settlement, and direct observations of habitat use by translocated populations, where available, may have more value for informing planned reintroductions. The suitability of a conservation translocation could be better gauged with a comprehensive assessment of the risks that may threaten initial and long-term survival at the destination environment.

The Evolution of Australian Wildlife Conservancy's Translocation Program and Improved Wildlife Conservation Outcomes

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[1]Australian Wildlife Conservancy, Australia

Biography:
I coordinate AWC's translocation program at a national level across ten feral predator-free and predator-suppressed areas in WA, NT, NSW, SA and Qld. I have led conservation science programs in Qld, NSW and WA, conducted translocations of several small-medium mammal species and a member of multiple recovery teams.

Australian mammals have one of the highest extinction rates in the world, primarily due to the impact of introduced predators. Australian Wildlife Conservancy (AWC) is a leading conservation NGO in Australia and has been conducting translocations of threatened mammals to feral predator-free and feral predator-supressed areas across Australia for over 20 years. To date AWC has translocated over 20 species to 10 sanctuaries and now encompasses meta-populations of several species highly susceptible to fox and cat predation, including Bilbies, Bettongs and Numbats.

The primary goal of AWCs' translocation program is to establish genetically diverse, self-sustaining and viable populations of threatened mammals. In the past 5-10 years the rate and complexity of these translocations has increased, as continued species decline in the wild highlight the need to maximise the conservation benefits of each translocation. Here we will provide an overview of AWC's national translocation program and discuss key concepts that have led to improve conservation outcomes, including restoring species assemblages and associated ecological processes, conserving genomic diversity and building metapopulations of some of Australia's most unique and threatened mammals.

Using monitoring data effectively to improve our predictions about translocation outcomes

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Biography:
Doug Armstrong has over 30 years' experience in reintroduction biology and has been the Oceania Chair of the CTSG since 1997. He has focused on monitoring, modelling and decision-making for reintroduction projects, and has edited two books on reintroduction as well as authoring ca. 100 journal articles and book chapters.

It has been well recognised since the 1980s that translocations should be monitored so we can learn from their outcomes. However, the nature of this learning usually remains unclear. While there have been numerous attempts to summarise translocation outcomes, this generally results

in summaries of success rates that have little or no predictive value for future decisions. We argue that learning is most effective when done in a formal adaptive management framework where predictions are progressiveness improved through Bayesian updating. We further argue that translocation programmes are inherently Bayesian because they should involve: 1) collating the data available when a translocation is proposed to make PRIOR predictions to guide whether it should to proceed; 2) collecting NEW DATA after release if a translocation proceeds; and 3) using the data to update the original model, allowing POSTERIOR predictions that can be used guide ongoing management of the population and to improve prior predictions for the next proposal. We illustrate how this process has been used to guide reintroductions of the toutouwai (North Island robin, Petroica longipes) to predator-managed areas in Aotearoa New Zealand. We discuss the challenges involved in extending this formal updating process to multi-species programmes.

Do trap door spiders lose the ability to re-burrow as they mature?

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Biography:
Justine is the Biodiversity Specialist for Alcoa's WA mining operations. She leads research on fauna conservation, focusing on understanding threatened species habitat use in the Northern Jarrah Forest and minimising impacts to native fauna from operations.

Short-range endemic taxa are those species characterised by poor dispersal powers and confinement to discontinuous habitats, which by their very nature, makes them susceptible to disturbance. Most mygalomorph spiders are classified as short-range endemics, remaining sedentary in their individual burrows, with the exception of mature males roaming in search of females. It is widely accepted that these spiders dig their burrow as juveniles after dispersal from their maternal burrow, then lose their ability to dig as they mature. A series of re-burrowing experiments with different mygalomorph species suggests that although individuals will remain in their original burrows preferentially, they have the ability to dig a new burrow as an adult, with 85% of individuals successfully re-burrowing without assistance. This has implications for the ethical collection of DNA samples as well as providing potential opportunity for translocation of threatened species.

Reintroducing platypuses to the Royal National Park

Dr Gilad Bino[1], Dr Tahneal Hawke[1], Professor Richard Kingsford[1], Mr Robert Brewster[3], Mr Andrew Elphinstone[2], Patrick Giumelli[3], Phoebe Meagher[2], Brendon Neilly[4]
[1]University Of NSW, Sydney, Australia, [2]Taronga Conservation Society Australia, Sydney, Australia, [3]WWF-Australia, Australia, [4]NSW National Parks & Wildlife Service, Australia

Biography:
Dr. Gilad Bino is an environmental scientist focused on freshwater ecology, conservation, and management. Dr Bino researches human impact on aquatic ecosystems and has notably contributed to platypus conservation efforts, raising awareness and devising protection strategies.

Habitat destruction and fragmentation have increased extinction risk for platypus populations. With climate projections indicating increased drought frequency and severity, these fragmented populations face augmented risk of local and permanent extirpation and declining genetic variability. Platypus conservation status varies from not threatened (National), 'Near Threatened' (IUCN Red List), 'Vulnerable' (Victoria)' to Endangered' (South Australia). Translocating individuals from thriving populations to areas where past threats have been mitigated is a vital conservation strategy which could contribute to the overall resilience

ecosystems and enhance the long-term survival of species. The Royal National Park, established in 1879 as the world's second-oldest national park, has had no confirmed platypus sightings for over 50 years. Comprehensive assessments of habitat suitability, food availability, and water quality confirm suitable conditions for sustaining platypuses yet eDNA surveys suggest none exist. In May 2023, 10 platypuses were translocated into the rivers of Royal National Park. Platypuses were collected from three rivers in New South Wales and reintroduced to the park through a unique collaboration between UNSW, Taronga Conservation Society, NSW National Parks and Wildlife Service, and WWF-Australia. We discuss the development and implementation of the translocation plan and the monitoring of reintroduced platypuses during the initial months. The project aims to reintroduce a self-sustaining, genetically diverse population within the park, marking the first platypus translocation in New South Wales. This landmark initiative will contribute towards a framework for future emergency response plans and a broad, adaptive conservation strategy that can enable conservationists to effectively translocate platypuses.

Forget the Shovel: Using 3D printed traps for the non-destructive extraction of burrowing spiders

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Biography:
Cameron Blackburn has been a Botanist and Structural Ecologist in WA for the last 15 years. His work has centred on vegetation classification and post-mining restoration, with a strong focus on data management, programming, and remote sensing. His career goal is to enable positive environmental change through technology enhanced solutions.

Trapdoor spiders (Mygalomorphae) in Western Australia are an area of active research, both from a taxonomic and conservation perspective. Requirements for field collection for genetic studies, as well as the potential translocation of individuals away from proposed land disturbance, require living specimens to be extracted from their burrows. However, trapdoor spiders are typically a highly immobile group of species, which rarely leave the protection of these burrows. Currently, individuals are collected by excavation, a process that is both time consuming, and has poor success rates, as well as having a high risk of poor outcomes for the individual, microhabitats, and progeny. To mitigate the potential for adverse outcomes of trapdoor spider excavation, a new method has been developed that removes the risk of harm to the individuals, as well as damage to the existing burrow. Through the utilisation of this method, a greater proportion of samples can be taken without harm to the individual, burrow, or microhabitat. This method unlocks a multitude of potential research pathways (i.e. returning individuals to their burrow, decreased stress in translocation, post-extraction behavioural studies), and a higher rate of success and efficiency in trapdoor spider collection.

Limitations to the Successful Reintroduction and Recovery of the Northern Aplomado Falcon in the U.S.

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Biography:

David Bontrager is a graduate student at Boise State University in Idaho, USA, in the Master's of Science in Raptor Biology program. His work partners with The Peregrine Fund and focuses on the reintroduced population of endangered Northern Aplomado Falcons in Texas, USA.

Northern Aplomado Falcons (Falco femoralis septentrionalis) were reintroduced to historical locations in the U.S. following their extirpation in the 1950s. A small breeding population now exists in South Texas, but remains small and isolated, with 23 breeding pairs found in 2022. Despite initial selection of suitable habitat for release sites, woody vegetation encroachment may be hindering population recovery by facilitating expansion of predatory owls, including Great Horned Owls (Bubo virginianus) and Barn Owls (Tyto alba). We tested this hypothesis using occupancy models to estimate how percentages of grass, shrubs, and Aplomado Falcon habitat affected owl occupancy at 65 locations (with a 1.2 km radius) in South Texas. Owl presence was monitored using repeated callback surveys in 2021 and 2022. Preliminary results suggest that Barn Owls were ubiquitous across habitat types, while Great Horned Owls occupied areas with more shrubs, particularly with shrub cover greater than 40%. Great Horned Owls were also less likely to be found with grass cover above 15%. Nest camera traps in 2021 also recorded Great Horned Owls visiting five Aplomado Falcon artificial nesting structures and Barn Owls visiting nine. Next steps include evaluating the effects of habitat and owl occupancy on nest success for Aplomado Falcons. Understanding the combined impacts of habitat and owl distributions on Aplomado Falcon nesting success will inform restoration efforts, determining which areas to prioritize for combating encroachment of woody vegetation, areas for future falcon releases, and areas that are important for acquisitions to maximize Aplomado Falcon reintroduction success

Importance of adaptive management during mallee emu-wren reintroduction

Dr Rebecca Boulton[1]
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Biography:
Over twenty years of experience working with endangered birds here in Australia, New Zealand and US including the translocation of the cooperative breeding Black-eared Miner and the tiny Mallee Emu-wren.

The mallee emu-wren is a tiny spinifex specialist now only found in the Victorian mallee of Australia. Drought and wildfire in recent decades has led to an overall population decline and the species going extinct in South Australia in 2014. The Threatened Mallee Birds Steering Committee, a group of dedicated government, non-government organisations, and individuals committed to delivering priority conservation actions for threatened mallee bird species, instigated the first phase of a reintroduction program for the species in 2018. Due to the challenging nature of the species cryptic behaviour, difficult habitat, and small body size an adaptive management framework was employed that allowed for workflow change during the reintroduction process. Important knowledge was gained on capture efficiency, animal husbandry, marking methods, source site impacts and the importance of release timing, all helping determine whether translocation was a feasible conservation tool for this endangered species. Short and long-term climatic conditions during and after releases are likely to be important for successful reintroductions of mallee emu-wren. This climatic dependency will constrain and make future reintroductions difficult, particularly around securing sufficient funding. Funding tied to grants with fixed timelines and milestones will not allow for the flexibility needed in such a changing and variable habitat particularly in the face of increased climate change.

Genetic rescue of the southern Brush-tailed Rock-wallaby

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Biography:
Willow Bourke is a Natural Environment Program Officer with the Department of Energy, Environment and Climate Action (DEECA) in Victoria, Australia. Willow coordinates the southern Brush-tailed Rock-wallaby program in East Gippsland and delivers a range of threat management projects in the 2019-20 bushfire footprint including weed and pest control.

The Brush-tailed Rock-wallaby (Petrogale penicillata) occurs along the Great Dividing Range from southern Queensland to eastern Victoria. The southern Evolutionary Significant Unit (sESU) has declined in Victoria to one extant population in East Gippsland and one reintroduced population in Gariwerd (Grampians) - both are threatened by predation, fire and genetic decline. The East Gippsland southern Brush-tailed Rock-wallaby (sBTRW) colony contains approximately 50 individuals and is monitored annually with remote cameras and cage trapping. Gariwerd has approximately 12 animals.
Captive breeding in the 1990s lacked suitable founders which reduced genetic fitness of captive populations. In 2012, a 25% central:75% southern gene mixing strategy (maintaining minimum 50% sESU) was endorsed to increase genetic diversity of the extant and captive populations. From 2015-18 four sBTRW were translocated from East Gippsland to Tidbinbilla Nature Reserve's (TNR's) captive program. Select captive and wild founders of southern and central ESUs formed controlled captive breeding at Mt Rothwell (MtR) and TNR.
Twenty founders from this program established an insurance population at MtR within a large predator-proof fence where animals reproduce naturally.
In 2019, 2020 and 2022, eleven hybrid sBTRW from MtR were translocated to East Gippsland. Early results for these translocations are encouraging: survival and movement - 66% of translocated animals successfully established and survived one year; reproduction – 30% of translocated animals bred successfully* by the third year; population size – stalled since the 2019-20 bushfires due to lack of recruitment; genetic diversity – insufficient time for this measure to be determined.
*assumed, awaiting genetic results

Warts this? Pigmented ear lesions and a novel papillomavirus in a reintroduced population of Boodies on Faure Island

Dr Amanda Bourne[1], Ms Fiona Knox[2,3], Dr David Forshaw[4], Dr Tim Hyndman[2], Miss Bryony Palmer[1]
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Biography:
Amanda Bourne leads the conservation science program on four wildlife sanctuaries in Western Australia. She leads a team of field ecologists and coordinates monitoring, research, animal translocations and strategic conservation planning. Amanda has a strong focus on evidence-based decision-making in biodiversity conservation.

Seventeen Boodies (Burrowing Bettongs, Bettongia lesueur) were introduced to Faure Island in 2002. The island now supports one of the largest Boodie populations in Australia. Faure has

been proposed as a source for Boodie translocations elsewhere. However, concerns about the cause and high prevalence of unusual ear lesions, first reported in 2003 and recorded in 75% of individuals (39/52) in 2022, means that Faure animals have not yet been used. In 2021 and 2022, comprehensive health assessments were conducted at Faure, collecting morphometric data, ear tissue biopsies and blood samples. Investigations were conducted at all other Boodie populations during 2022 and 2023. Preliminary results from Faure showed that the odds of detecting a novel papillomavirus were 9.3 times higher in Boodies with ear lesions (95% CI: 2.28-37.9; p = 0.001). While an alternative cause for the pigmented, plaque-like and papillomatous changes is possible, such lesions are associated with papillomaviruses in other species. The significance of the association in Boodies is unclear because 1) the Faure population is large and stable; 2) affected individuals were otherwise healthy; 3) 14 individuals with no lesions tested positive for papillomavirus; 4) lesions were detected in three other island populations; 5) the papillomavirus was detected in one other island population; and 6) no lesions were detected in the mainland populations. With lesions and papillomavirus already present in other populations, and given no detectable health impacts of either, they likely present a low risk to conservation translocations of Boodies using the Faure population as a source.

Mitigation translocation of the Western Spiny-tailed Skink (Egernia stokesii badia) in a conservation context

Dr Holly Bradley[1]
[1]Curtin University, Perth, Australia

Biography:
Dr. Holly Bradley completed her PhD working with the ARC Centre for Mine Site Restoration at Curtin University in Western Australia. Her research focussed on improving the translocation management of the endangered Western Spiny-tailed Skink (Egernia stokesii badia), known as meelyu to the local Badimia people of the Mid West.

Translocation has become a major conservation tool used around the world as a method intended to safeguard threatened species from further decline. However, the increase in number of translocations has not necessarily corresponded with an increase in success or knowledge of best practice. Maximising the efficacy of translocations is critical, given limited global conservation funding and continued pressure on threatened species populations. This is particularly relevant to reptile translocations in Australia, which is a global hotspot for reptile diversity, yet suffers a significant knowledge gap surrounding the conservation status and ecological requirements of its diverse reptilian fauna. The Western Spiny-tailed Skink (Egernia stokesii badia) is used as a case study to exemplify how understanding the ecological needs of a threatened species can help maximise the likelihood of mitigation translocation success, following the more planned and informed framework generally associated with more conservation-motivated translocations. This study helps provide a clear strategic framework for the targeted research of meaningful ecological factors that influence on-ground translocation decision making and is adaptable for the improved management of a range of other fauna, including other threatened restricted range endemic reptiles.

Establishing a new wild population of critically endangered Helmeted Honeyeaters

Dr Nick Bradsworth[1], Dr Dan Harley[1]
[1]Zoos Victoria, Healesville, Australia

Biography:
Nick is an ecologist with over a decade of experience working with threatened bird species. Although his PhD focused on documenting Melbourne's threatened Powerful Owl movements with GPS transmitters, more recently Nick has been working with Zoos Victoria establishing additional populations of Helmeted Honeyeaters through translocations and captive-releases.

Range-restricted species are among those at greatest risk of extinction due to climate change. The critically endangered Helmeted Honeyeater provides a good illustration of this, where the last wild population is confined to a single locality at Yellingbo, 50 km south-east of Melbourne. The establishment of new populations to provide risk-spreading is an urgent priority for the Recovery Team, however options are limited owing to the widespread destruction of the taxon's preferred habitat. Following an assessment of potential translocation sites throughout the species' historic range, between 2021 and 2023, a total of 68 Helmeted Honeyeaters were released to a new location in the Yarra Ranges National Park, 30 km from the last wild population at Yellingbo. In 2021, 32 birds were released, comprising 14 captive-bred, and 18 wild-sourced birds. Post-release monitoring revealed that the captive-bred birds displayed far greater post-release site fidelity. The 2022 and 2023 release cohorts comprised of 16 and 20 individuals, respectively, and all were captive-bred. To encourage site fidelity and support population establishment, birds are provided supplementary food across a series of dispersed feeding stations. Adjusted focus camera traps at these stations have provided an effective, novel method to monitor colour-banded individuals in the translocated population. Nesting success will be a key determinant of site viability, and while 13 nestlings have successfully fledged across the 2021-22 and 2022-23 breeding seasons, predation of nestlings by tiger snakes is emerging as a potential issue for this population.

Maximising the potential of a reintroduction through the inclusion of genetic data

Ms Brittany Brockett[1]
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Biography:
Brittany is a PhD Candidate working with the Mulligans Flat - Goorooyarroo Woodland Experiment team, based at the Australian National University. She is focused on the importance of project-and-species- specific context for reintroduction management, and the integration of genomics into conservation.

Translocations and reintroductions are fast becoming a go-to management approach, with a vast array of species undergoing conservation translocations to mitigate the global biodiversity crisis. However, not all translocations are equal. There are many project- and- species- specific factors to take into account when planning, implementing, and monitoring translocations, such as the number of source populations to draw from, genetic diversity of the focal population, or the breeding biology of the species. It is therefore important to avoid a one-size-fits-all approach to translocations, in order to avoid delayed or reduced conservation gain.
In this presentation I will use the reintroduction of the eastern bettong (Bettongia gaimardi) and the eastern quoll (Dasyurus viverrinus) to the Mulligans Flat Woodland Sanctuary as case studies, demonstrating how genetic analyses have value-added to the reintroduction project. I will outline how source population context dictates appropriate genetic monitoring plans, and show that using a regular, intermittent sampling regime can maximise the information gained from genetic analyses. I will explain how this genetic monitoring has allowed me to enhance our understanding of the focal species, revealing new knowledge about breeding systems. Finally, I will show how a species' breeding biology can be harnessed to maximise the effectiveness of a reintroduction programme, enhancing the genetic diversity of a founding population.

Genetic rescue of the Coastal Fontainea (Fontainea oraria) a critically endangered rainforest tree from NSW

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Biography:
Di Brown is a Senior Threatened Species Officer in the NSW Department of Planning and Environment. She has nearly thirty years experience working on threatened species projects in northern NSW. Di works primarily on threatened plant species, including a number of rainforest species and long-term flora translocation projects.

Recovering a species has developed far beyond simply increasing the number of individuals of that species over time. Incorporating genetic analysis into conservation translocation programs is increasingly being used to improve the success of these programs by ensuring genetic diversity is not lost, thus maximising the chances of adaptability to a range of threats and future conditions.
This presentation discusses the conservation translocation of the rainforest tree Coastal Fontainea (Fontainea oraria: Euphorbiaceae) as an example of a successful genetic rescue program.
The critically endangered Coastal Fontainea was previously known from a population of only ten mature specimens and a small number of seedlings in littoral rainforest in northern NSW. Genetic studies identified lower genetic diversity amongst seedlings of the Coastal Fontainea, prompting a translocation program aimed at avoiding further loss of genetic variation. The translocation program was carefully designed to maximise opportunities for pollen exchange between plants, thus promoting genetic diversity.

Commencing in 2010, the translocation program currently consists of 22 sites containing representatives of all ten mature plants at each site. Many of these plants have flowered and produced fruit, and subsequent germination of seedlings under planted specimens has been prolific at a number of sites. The total number of plants is now over 5000 individuals.

Most significantly, genetic sampling of seedlings and seed produced from the translocation plantings indicates that unique combinations of parents are occurring in comparison to wild seedlings, including genetics from previously unrepresented wild adult plants in the seedling population, indicating the success of the translocation program.

Prioritising populations as sources for genetic mixing: guidelines from a simulation framework

Dr Sean Buckley[1]
[1]University of Western Australia, Perth, Australia

Biography:
Postgraduate researcher in conservation genetics using genetic information to inform conservation management, particularly in relation to translocations and genetic mixing in Australian mammals. Key research focus on understanding when, and how best to, conduct genetic mixing of imperilled populations.

The translocation of individuals into genetically divergent populations – "genetic mixing" or "genetic rescue" – is useful for recovering the viability of bottlenecked populations. However,

limited understanding of how various demographic and genetic characteristics might influence the outcome of genetic mixing has hindered its uptake in conservation practice. In particular, managers are often faced with the challenging decision of where – if at all – to source individuals for genetic rescue. Using a genetically explicit simulation framework based on the genomes of four mammal species, I investigated how different demographic characteristics (e.g., population sizes; level of divergence; number of individuals translocated) impact the efficacy of genetic mixing. I then assessed the relative importance of these variables on mixing outcomes using generalised linear models. Preliminary results indicate that population sizes have the greatest impact on genetic mixing efficacy – with larger and more diverse source populations providing the strongest benefit. Contrastingly, the number of individuals translocated had a much smaller impact, indicating that positive outcomes from genetic mixing can occur even when few individuals are translocated. From these findings, I developed a novel Potential Source Index which quantifies the relative suitability of potential source populations across a dataset. This simple index will provide managers with an interactive and accessible decision-making framework for choosing source populations in real genetic mixing programs.

Looking forward: how can conservation translocations continue to improve conservation prospects for the Endangered Noisy Scrub-bird (Tjimiluk- Atrichornis clamosus)?

Mrs Sarah Comer[1], Dr Abby Berryman[2], Dr Saul Cowen[2], Mr Alan Danks[2], Dr Allan Burbidge[2]
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Biography:
Sarah led the Noisy Scrub-bird Recovery Program from 1999-2022 and was the chair of the South Coast Threatened Birds Recovery Team from 2008 -2022. She has been involved in translocations and conservation management of threatened species for over 20 years.

The success of the Noisy Scrub-bird/Tjimiluk (Atrichornis clamosus) translocation program in securing the rediscovered population of this cryptic semi-flightless songbird, once considered extinct, has been widely acknowledged in the conservation community. Nevertheless, the species remains restricted to an area of less than 30,000 ha just east of Albany. While translocation efforts, which commenced in 1983, have undisputedly resulted in a more promising future for this species, there are numerous insights from the previous 40 years of translocations that can be used to guide future conservation work. Continuing to establish new populations over a larger geographic area is key to the longer-term conservation of the Noisy Scrub-bird. Research into territorial song and population genetics has provided insights into the social structure of scrub-birds and the importance of further translocations to support genetic management. However, the scrub-bird is still listed as endangered and with the likelihood of unplanned fire increasing, and climate change likely to modify suitable habitat, having multiple populations remains a priority for the recovery team. Learning from failures has resulted in a more conservative approach to testing release sites with small initial numbers of founders, but more work is needed to identify suitable habitats that may be resilient to a changing climate and to increase effectiveness of the translocation program. In this presentation we summarise 40 years of translocations and provide some perspective on directions for the future management of this unique songbird.

Large-scale, multi-species plant translocation in the Jarrah Forest

Dr Lucy Commander[1,2], Mr Cameron Blackburn[1], Mr Greg Mullins[1], Dr Justine Barker[1]
[1]Alcoa, Pinjarra, Australia, [2]The University of Western Australia, Crawley, Australia

Biography:
Dr Lucy Commander is the Environmental Research Superintendent at Alcoa, overseeing the research program for Alcoa's mine in the Jarrah Forest in south-west Western Australia. Lucy is a restoration seed ecologist, and she was lead editor of the Guidelines for the Translocation of Threatened Plants in Australia (3rd edn).

Each year, several hundred hectares of land is restored following mining in the Northern Jarrah Forest in south-west Western Australia. The aim of the restoration program is to recreate a self-sustaining Jarrah Forest ecosystem that requires no additional management practices to adjacent unmined forest. Given that all biological material (i.e. vegetation and topsoil) is removed prior to mining, plant return is almost exclusively through translocation, where plants and seeds are transferred from an ex-situ collection or natural population to a new location. The sources of plants for program are: the soil seedbank within fresh and stockpiled topsoil; seeds collected from the surrounding forest and stored under ex situ conditions until seeding; and plants propagated from seeds, cuttings or tissue culture. Seed and plant traits dictate the method of plant return, with additional drivers such as material availability, cost effectiveness and establishment success also considered. The topsoil seedbank contains persistent, geosporous seeds. Serotinous (canopy stored) species and additional geosporous species are seeded. Species that are clonal, or do not produce many seeds are propagated in nurseries and planted. Seeds of forty species and tubestock of fifteen species of plants are used, supplementing >100 species replaced through topsoil.
Plant species richness and density is monitored and compared with restoration targets (completion criteria), informing adjustments to future seeding and planting rates. Experiments to improve success have included fertiliser treatments, pot types, propagation methods, companion planting and plant guards. This adaptive management approach has been ongoing since restoration using endemic flora began in 1988.

Reproductive skews and admixture in first generation of reintroduced greater bilby (Macrotis lagotis) populations

Brianna Coulter[1]
[1]University of New South Wales, Sydney, Australia

Biography:
Brianna Coulter is a PhD student at UNSW, Sydney studying translocations in the greater bilby (Macrotis lagotis). Her research focuses on admixture and reproductive skews following reintroductions, ecosystem impacts on burrowing invertebrates, and behaviour in both reintroductions and supplementations.

Reintroduction founding events underpin the genetic diversity, fitness, and long-term viability of translocated populations. Admixture is one strategy that can be used to maximise genetic variation but individual founders and reproductive skews in the first generation following translocation can result in bottlenecks and loss of genetic lineage. To test the effectiveness of admixture in populations of greater bilby (Macrotis lagotis) reintroduced to three predator-free safe havens, we measured genetic diversity, and conducted population structure and parentage analyses of founders and first-generation offspring. Bilbies were reintroduced to Mallee Cliffs National Park and two separate exclosures (Mingku, Thipa) in Sturt National Park as part of the Wild Deserts Project between 2019 and 2021. Two of the populations were established with founders with ancestry from two genetic clusters and both lineages were detected in first generation recruits. Despite this, reproductive skews were detected. Fewer than half of the male founders at all three sites sired young in the first 4-12 months post-release. One male reintroduced to Wild Deserts Thipa sired 67% (8/12) of the offspring and two reintroduced to Mallee Cliffs sired 47% (17/36) of the offspring combined. Wild Deserts Thipa was founded with

males sourced from Arid Recovery and Thistle Island, but despite having the same genetic ancestry, only Arid Recovery males sired young. These skews indicate that supplementations may be required to limit genetic drift, inbreeding and loss of genetic lineage. Further analyses should be undertaken to determine if these skews persist beyond the first generation.

Having a look at translocated plant species across European countries: is there a bias in phylogenetic or functional diversity?

Dr Filipa Coutinho Soares[1], Abdoulatif Sene[1], Ms Nadline Kjelsberg[2], Dr Anne-Christine Monnet[3], Professor Bruno Colas[4], Dr Maud Mouchet[1], Dr Jean-Baptiste Mihoub[5], Dr Alexandre Robert[1], Dr Carmen Bessa-Gomes[4], Professor François Sarrazin[5]
[1]National Museum of Natural History, Centre for Ecology and Conservation Sciences, Paris, France, [2]University of Bern, Institute of Plant Science, Bern, Switzerland, [3]University of Liège, Gembloux Agro-Bio Tech, Gembloux, Belgium, [4]University of Paris-Saclay, CNRS, AgroParisTech, Systematic Ecology and Evolution, Gif-sur-Yvette, France, [5]University of Sorbonne, Centre for Ecology and Conservation Sciences, Paris, France

Biography:
Filipa Coutinho Soares has a PhD in Macroecology from the Faculty of Sciences of the University of Lisbon. Currently, she is a postdoc at Centre d'Ecologie et des Sciences de la Conservation studying how translocated species have contributed to the functional and phylogenetic diversity of native communities at multiple scales.

Conservation translocations have been widely used to reverse the effects of population extirpations. Most translocations are species-centred, being implemented at the local scale and usually targeting charismatic species, especially among birds and mammals. This taxonomic bias influences how translocations contribute to the conservation of phylogenetic and functional diversity at global and regional scales. Compared to animals, little is still known about plant translocations. Here, we take advantage of a comprehensive multi-taxa database of conservation translocations to investigate the taxonomic, phylogenetic and functional biases of plant translocations across nine European countries. Focusing on 16651 angiosperm species, we assess whether translocated plant species are representative of the phylogenetic and functional diversity of native plant communities at global and country-level scales. We also explore if plant translocations balance or reverse extinction risks regardless of taxonomic group, by interpreting biases in the light of species conservation status at global and national levels. Plant translocations are biased towards particular groups, with some orders being over-represented globally and across countries. Differences between countries may result from distinct national conservation targets or variations in public and political support. The taxonomic bias is reflected in both phylogenetic and functional diversity at the country level. Translocations appear to have targeted mostly herbaceous plants, with very few climbers, epiphytes and parasite plants found among translocated species. We discuss how these biases affect the conservation of phylogenetic and functional diversity and the importance of taking them into account when making recommendations for conservation practices and public policy at a continental scale.

The challenge of designing meaningful success criteria for conservation translocations in the face of uncertainty

Dr Saul Cowen[1], Dr Colleen Sims, Dr Allan Burbidge, Dr James Friend, Dr Kym Ottewell, Dr Lesley Gibson
[1]Department of Biodiversity, Conservation and Attractions, Woodvale, Australia

Biography:
Saul is a Research Scientist with the Western Australian Department of Biodiversity, Conservation and Attractions, focused on achieving better management outcomes for threatened fauna, including conservation translocations. Between 2017 and 2022 he oversaw translocations of seven species to Dirk Hartog Island National Park.

We all hope that our conservation translocations will meet with success, and we expend much time and energy planning for a positive outcome. However, in reality, many translocations fail. Defining what makes a translocation 'successful' can be challenging and this difficulty may be magnified when working with cryptic or poorly studied species or when multiple species are involved. Criteria for success must be relevant to the objectives of the translocation, should be measurable and have realistic timeframes for achievement. However, how we evaluate progress against these criteria is highly dependent on our ability to effectively monitor a species, which may be constrained by its behaviour, the release methods or the release environment, including sympatric species. Ineffective monitoring strategies may render some criteria difficult or impractical to evaluate. Finally, poorly defined success criteria may result in apparently successful translocations failing to achieve their stated criteria, or translocations that meet their success criteria but are ultimately doomed to failure.
Here, we discuss the challenges that have been faced with defining and evaluating success for a fauna reconstruction program on Dirk Hartog Island in Western Australia. To date seven species have been translocated to the island, all showing initially promising signs. However, the achievement of success criteria within prescribed timeframes has been mixed and has highlighted deficiencies in how we define and measure success. We discuss how we have adapted to this and how this experience has shaped the way we think about success criteria for future translocations.

Recent Dramatic Declines Sound Alarm and Demand Urgent Action for Hawaiian Honeycreepers

Dr Lisa Crampton[1], Mr. Justin Hite[1], Dr Lainie Berry[2], Dr. Eben Paxton[3]
[1]Pacific Cooperative Studies Unit - KFBRP, Hanapepe, United States, [2]Hawaii Division of Forestry and Wildlife, Honolulu, USA, [3]USGS - PIERC, Volcano, USA

Biography:
Dr. Lisa "Cali" Crampton has led the Kauai Forest Bird Recovery Project since 2010, where research has documented the dramatic declines of the Hawaiian Honeycreepers on Kauai Island and the concurrent advance of mosquito-borne disease. Her team employs various tools to save these species from extinction.

Hawaiian honeycreepers are experiencing a wave of extinctions that may see the loss of most remaining members of this unique family within the decade. The greatest current threat to Hawaiian forest birds is introduced mosquito-borne diseases, notably avian malaria. Honeycreepers are highly susceptible to these diseases, as they evolved in their absence. We present data to show that this crisis is accelerating and discuss management options, including translocation, conservation breeding and in situ measures. New results suggest that climate change is increasing the prevalence of mosquitoes and disease within critical habitat. Recent data also show that several endemic species on Kauai Island have suffered recent population crashes. Most notably, Akikiki (Oreomystis bairdi), declined from 440 in 2018 to fewer than 100 individuals in 2021, and adult survival probability dropped from 0.75 in 2015 to 0.34 in 2020; this species will likely go extinct in the wild by 2023. Akekee (Loxops caerulurostris) numbers several hundred birds and will likely disappear by 2030. There are tools under development to control of mosquitoes and avian malaria, but their earliest possible initial implementation is estimated to in 2024, thus ex situ measures are also on the table. We discuss the need for bold

intervention and present some innovative solutions to prevent extinction of these remaining unique species.

Translocation vs natural recolonisation; A comparison of two conservation strategies for the crest-tailed mulgara

Ms Dympna Cullen[1], Dr Reece Pedler[1], Dr Rebecca West[1], Associate Professor Katherine Moseby[1,2], Dr John Read[2], Professor Richard Kingsford[1]
[1]School of Biological, Sarth and Environmental Science, University of New South Wales, Randwick, Australia, [2]Ecological Horizons, Eyre Peninsula, Australia

Biography:
Dympna is a PhD candidate at the University of New South Wales and a field ecologist at Wild Deserts. She completed a Masters of Wildlife Health and Population Management at the University of Sydney.

Translocation to fence 'safe-havens' is a conservation tool widely used in Australia to re-establish locally extinct species. Alternatively, effective management of in-situ extant populations can negate the need for costly translocations. We compared two methods of conservation for the ampurta (Dasycercus cristicauda), a carnivorous marsupial which suffered dramatic range retraction following the introduction of feral cats (Felis catus) and foxes (Vulpes vulpes). The species is listed as vulnerable nationally and extinct in New South Wales (NSW) which made it a candidate for translocation to the Wild Deserts 'safe-haven' in NSW where 19 animals were released in 2020. Concurrently, the species had undertaken a 70-fold range expansion within South Australia (SA) in the 20 years following the release of rabbit haemorrhagic disease virus which reduced rabbit numbers and subsequently introduced predator numbers. We used track-plots, trapping and genetic analyses to assess the presence of ampurta in SA and NSW from 2020 – 2022. Ampurta increased their extent of occurrence by a further 48,563km2, and naturally colonised areas of NSW both inside and outside the fenced 'safe-haven'. They were also present in areas where they were not translocated, including on pastoral properties 60km from the SA/NSW border. Analyses show that while some of these sites had been colonised by translocated animals and their descendants, others were naturally recolonised. Our results suggest that investment in tools for broad landscape recovery may provide an alternative to translocations for some species, or may be able to support an initial translocation to achieve landscape scale recolonisation.

Development of a Plant Translocation Database for the European continent

Dr Sarah E Dalrymple[1,4], Ms Hannah Branwood[1], Dr Andreas Ensslin[2], Mr Thomas Abeli[3,4], Dr Sandrine Godefroid[5]
[1]Liverpool John Moores University, Liverpool, United Kingdom, [2]Conservatory and Botanic Garden of the City of Geneva, Geneva, Switzerland, [3]Department of Science, Roma Tre University, Rome, Italy, [4]IUCN Species Survival Commission Conservation Translocations Specialist Group, , , [5]Meise Botanic Garden, Meise, Belgium

Biography:
Sarah is a Reader in Conservation Ecology with a specialism in threatened plant conservation particularly focussing on conservation translocations and climate change. She co-authored the IUCN Guidelines for Reintroductions and Other Conservation Translocations (IUCN 2013), the Scottish Code for Conservation Translocations (2014) and sites on the English Species Reintroductions Taskforce.

To respond effectively to European conservation policies, plant translocations must inevitably increase to enable species to colonize habitats that they are unable to reach by natural dispersal. However, in Europe, case studies, best practice and experiences of plant translocations are not sufficiently disseminated to the plant conservation community, most often remaining in unpublished internal reports to which access is difficult.

To address this gap, a survey was developed comprising 37 questions covering: (1) Basic biological and geographical information; (2) Translocation details; (3) Reasons which motivated the choices; (4) Obstacles; and (5) Translocation results. The survey was distributed in various formats in June 2022 to 349 conservationists active in plant translocations and announced at the IPTC2022 in Rome.
We received about 1,700 responses to the survey. In addition to this, we also searched for all available information in the scientific literature, existing regional databases and the grey literature in English, French, Dutch and Spanish. These supplementary data ultimately represent about 1,300 additional cases.

The database now contains 3,014 cases of plant translocations performed on 1,087 taxa in 29 European countries. This talk will highlight some interesting results from the preliminary analyses of the database. A Data Sharing Agreement is being developed with all data providers to publish (part of) this database on an online platform so that people working on the same species or habitats can exchange their respective expertise to improve translocation science and practice throughout the European continent.

Factors determining adult survival and recruitment to breeding populations among reintroduced Oriental Stork

Dr Tomohiro Deguchi[1]
[1]University of Hyogo, Toyooka, Japan

Biography:
I was in charge of Short-tailed Albatross reintroduction projects at Yamashina Institute for Ornithology during 2005-2019, and currently handle Oriental Stork reintroduction at University of Hyogo.

Long-lived territorial bird populations often consist of a few territorial breeding adults and many non-breeding individuals. These populations are highly threatened by anthropogenic activities and climate change because breeders often have a high demand for habitat quality; these characteristics have promoted many conservation translocations. High non-breeder survival is a key factor in the success of these attempts. Success should also be greatly influenced by the transition rate of non-breeders to breeders. Reintroductions of Oriental Stork, a long-lived territorial species, were initiated in Japan in 2005 to restore the former species range using captive birds. The purpose of this study was to elucidate the factors determining adult survival and recruitment to breeding populations in the reintroduced stork. Breeding experience was identified as the most important factor determining survival probability among adult birds, while generation was identified as the most important factor determining the survival probability of birds that emerged in the wild over the first three years after reintroduction. A low breeding probability of adult males was detected for a specific haplotype of the reintroduced population. The reintroduced Oriental Stork population has been steadily growing, and the non-breeder to breeder ratio appears to be acceptable. However, this study revealed that the initial survival probability of reintroduced birds declined with each passing generation. Therefore, accelerated habitat restoration is desired for the sustained growth of reintroduced populations.

Moreover, captive breeding and release history might contribute to an increase in the proportion of less-adaptive genetic types in the wild.

Rewilding and Indigenous conservation: a looming conflict or a new opportunity?

Dr Tristan Derham[1]
[1]University of Tasmania, Hobart, Australia

Biography:
Tristan Derham is a research associate with the ARC Centre of Excellence for Australian Biodiversity and Heritage (CABAH), facilitating policy engagement by academic researchers. In his own research, Tristan brings the tools of environmental philosophy to bear on problems raised by contemporary conservation and restoration practices.

Rewilding, an ambitious agenda of animal introductions for the restoration of ecological processes, shows great promise for conservation in North America and Europe. Whether it can be similarly applied in Australia remains to be seen.

Ambitious, nature-based, animal-centric, and holistic in its approach, rewilding can help with some of Australia's deep ecological problems. The sheer scale of extinctions and failing ecological processes cries out for ambitious solutions. Entire landscapes have been denuded of ecological engineers and apex predators. Conservationists are struggling to protect threatened species in open landscapes. The concept of rewilding offers a proactive approach, boosting conservation optimism among practitioners and the general public.

But rewilding, as it has developed thus far, is on a collision course with traditional Indigenous practices in Australia and elsewhere. If rewilding implies a 'hands-off' approach to land care, or the reinstatement of wilderness, then it cannot be reconciled with traditional practices of creating and maintaining cultural landscapes.

In the interests of inclusive conservation, social justice and environmental equity, conservation practitioners should meaningfully engage with Traditional Owners. Inviting dialogue with Traditional Owners, I propose a synthesis of rewilding and Indigenous land care principles to inspire ambitious, holistic restoration projects with Indigenous communities.

Conservation Translocation to Circumvent High Hatch-Year Mortality and Increase Site Fidelity: Burrowing Owl Head-Starting in Alberta, Canada

Mr Graham Dixon-MacCallum[1], Dr Troy Wellicome[2], Natasha Lloyd[3], Dr Axel Moehrenschlager[3]
[1]Wilder Institute/Calgary Zoo, Calgary, Canada, [2]University of Alberta, Edmonton, Canada, [3]IUCN Species Survival Commission, Conservation Translocation Specialist Group

Biography:
Graham leads a burrowing owl conservation translocation project for the Wilder Institute/Calgary Zoo in Alberta, Canada, and has also studied anti-predator behavior in a conservation breeding population of Vancouver Island marmots. Graham completed a B.Sc. in Biology at Acadia University and an M.Sc. in Biology at the University of Victoria.

Burrowing owls (Athene cunicularia) are threatened or at-risk throughout much of their distribution in western North America. Sharpest declines have been observed in the breeding populations of the Northern Great Plains, and in Canada they are listed as Endangered. For Canada's Burrowing Owl populations, the most limiting life-stage is the ½-year period from juvenile to 1st-year adult. To test if the population bottleneck during this life stage could be circumvented, a head-starting project was initiated in 2016. Burrowing owl nests were located each spring and youngest brood-members were taken into human care when > 20 days old. These owlets were held over winter until being soft-released the following spring as adults near capture sites. Between 2016 and 2022, we brought 94 owlets into human care and we released 93 owls: 42 male-female pairs, and 9 lone females. We tracked 81 owls post-release with satellite transmitters, and released 12 owls without transmitters. To control for possible transmitter effects on survival during migration, we removed 21 transmitters at the end of the breeding season. Released owls initiated 46 nests, of which 37 were successful, fledging 195 owlets. To date, 1 banded-only owl has returned from migration to breed for a 2nd time, and 1 owl migrated and survived winter carrying a transmitter. In addition, through band re-sighting, we confirmed a minimum of 12 (6%) offspring produced by head-started owls migrated and returned to our study area. Head-starting shows promise but further study is needed to develop strategies for improving survival on migration.

Critically Endangered Vancouver Island Marmots Exhibit Loss of Predator Discrimination Within Five Generations in Human Care

Mr Graham Dixon-MacCallum[1], Mr Jonathan Rich[1], Natasha Lloyd[2], Dr Daniel T Blumstein[2,3], Dr Axel Moehrenschlager[2]
[1]Wilder Institute/Calgary Zoo, Calgary, Canada, [2]IUCN Species Survival Commission, Conservation Translocation Specialist Group, [3]Department of Ecology and Evolutionary Biology, University of California, Los Angeles, USA

Biography:
Graham leads a burrowing owl conservation translocation project for the Wilder Institute/Calgary Zoo in Alberta, Canada, and has also studied anti-predator behavior in a conservation breeding population of Vancouver Island marmots. Graham completed a B.Sc. in Biology at Acadia University and an M.Sc. in Biology at the University of Victoria.

The Vancouver Island marmot (Marmota vancouverensis) is a critically endangered endemic in Canada which has been captive-bred for 24 years for reintroductions and reinforcements that have increased the wild population from ~30 to more than 200 individuals. Despite this success predation represents a major hurdle to marmot recovery. To better understand if captive-bred marmots are prepared for the environment into which they will be released, and to determine whether such suitability changes over time, we presented taxidermy mounts of mammalian predators and non-predators to marmots that were wild-caught, and captive born for between one and five generations. We also examined mortality of offspring from marmots we tested that had been released to the wild. A minimum of 43% of offspring were killed by predators in the wild over 17 years, most by cougars. Marmots in captivity generally responded to taxidermy mounts by decreasing foraging and increasing vigilance. However, marmots in captivity for more than two generations lacked discrimination between cougars, non-predators, and controls, suggesting a rapid loss of predator recognition. This study underscores the value of initiating behavioural assessments early in captive populations and repeating those assessments after a number of generations. That changes occurred relatively rapidly (within five generations), during which changes in genetic diversity were negligible, suggests that behavioral suitability may deteriorate more rapidly than genetics would suggest. Strategies addressing potential behavior loss should be considered, including sourcing additional wild individuals or pre-release

training. Subsequently, post-release survival should be monitored to determine the efficacy of behavior-optimization strategies.

Pua o Te Rēinga, Te Kura i Huna: Kaupapa Māori approaches to reindigenising taonga species translocations

Ms Aaria Ripeka Dobson-Waitere[1]
[1]Te Herenga Waka - Victoria University of Wellington, New Zealand

Biography:
I'm passionate about exploring my bi-cultural heritage and how the different knowledge systems can make positive contributions towards environmental and cultural restoration of the environment and people, bringing to life the saying: Ko au te taiao, ko te taiao ko au – I'm the environment and the environment is me.

There are 3 key reasons that prompted my interest in this topic. Firstly, indigenous biodiversity in Aotearoa NZ is declining at an unprecedented rate (Department of Conservation, 2017). Secondly, the current approaches to assessing conservation management are largely informed by Western knowledges with little to no recognition for Indigenous knowledges and values (Wehi and Lord 2017, Ens et al. 2021). Finally, species translocations are often focused on larger, more charismatic species (Griffith et al, 1989). For example, in Aotearoa NZ there has been a focus on translocating native birds and less attention on threatened plants or freshwater species.

Using the unique case study of Pua o te Rēinga, Dactylanthus taylorii, I will apply Kaupapa Māori Methodologies using a mixed-methods approach to understand the knowledges and values that inform taonga species translocations from an indigenous te ao Māori perspective. The outcome and impact of this study will help to resist the dominance of Western Knowledge approaches, and decolonise the thinking and implementation of decision-making in relation to species translocations.

Achieving conservation outcomes in plant mitigation translocations; the need for global standards

Ms Chantelle Doyle[1], Mr Thomas Abeli[2], Matthew Albrecht[3], Joe Bellis[4], Professor Bruno Colas[5], Dr Sarah E Dalrymple[4], Dr Andreas Ensslin[6], Jaime Espejo[7], Paul L.A. Erftemeijer[8], Margaux Julien[9], Wolfgang Lewandrowski[10], Hong Liu[11], Dr Axel Moehrenschlager[12], Dr Mark Ooi[1], Deborah M. Reynolds[13], Bertrand Schatz[14], Mari Sild[15], Timothy J. Wills[16], Guillaume Papuga[14]
[1]UNSW, Kensington, AUS, [2] Roma Tre University, Rome, Italy, [3] Missouri Botanical Garden, St. Louis, USA, [4] Liverpool John Moores University, Liverpool, UK, [5] Université Paris-Saclay, Orsay, France, [6]Conservatory and Botanic Garden of the City of Geneva, Geneva, Switzerland, [7] Pontifcia Universidad Católica de Chile, Santiago, Chile, [8]University of Western Australia, Crawley, AUS, [9]Ecotonia, Eguilles, France, [10]Kings Park Science, Kings Park, AUS, [11] Florida International University, Miami, USA, [12] IUCN Species Survival Commission Conservation Translocation Specialist Group, Calgary, Canada, [13] Victoria University, Melbourne, AUS, [14]University of Montpellier, Montpellier, France, [15]Tallinn Botanic Garden, Tallinn, Estonia, [16]The Ecology Office, Warranwood, AUS

Biography:
Chantelle is completing a PhD at the University of New South Wales in the field of threatened plant translocation , with a focus on ecology, legislation, practitioner experience and communication. To celebrate the work of Australian practitioners she co-created created a series videos and podcasts focused on plant translocations, www.plant-heroes.com

When translocation is used exclusively to mitigate development impacts, it is often termed a 'mitigation translocation.' However, both the definition and processes vary between countries and jurisdiction, resulting in inconsistent standards and procedures that compound the mortality of translocated individuals. Consequently, mitigation projects rarely achieve the intended 'no net loss' of protected species. Instead, mitigation translocations are often process driven, focused on legislative requirements which enable the development to proceed, rather than meaningful attempts to minimise the ecological impact of developments and demonstrate conservation outcomes.
Following the first International Plant Translocation Conference, a global group of practitioners collaborated to:

- Propose a global definition of mitigation translocation and
- Create tiered standards to which all proposals should adhere.

The goal of the proposed definition and standards is to frame mitigation translocations as conservation driven, ensuring best practice implementation and a quantified no net loss for impacted species.
Employment of these standards is relevant to development proponents, government regulators, researchers, and translocation practitioners and will increase the likelihood of conservation gains within the mitigation translocation sector.

Short-term trial reintroductions of two Extinct in the Wild reptiles to Christmas Island

Dr Jon-Paul Emery[1], Dr Leonie Valentine[2], Mr Brendan Tiernan[3], Mr Kent Retallick[3], Dr Harold Cogger[4], Prof John Woinarski[5], Prof Nicola Mitchell[6]
[1]University Of Southern Queensland, Toowoomba, Australia, [2]WWF, Peeramon, Australia, [3]Christmas Island National Park,, Drumsite, Australia, [4]John Evans memorial fellow, Australian Museum, Sydney, Australia, [5]Research Institute for the Environment and Livelihoods, Charles Darwin University, Darwin, Australia, [6]School of Biological Sciences, The University of Western Australia, Crawley, Australia

Biography:
I am an ecologist and completed my PhD in 2021 on Christmas Island undertaking the first reintroduction trials of the Extinct in the Wild blue-tailed skink and Lister's gecko. I am now a post-doctoral research fellow at the University of Southern Queensland designing monitoring methodologies for threatened reptiles.

Conservation translocations are an important tool for the recovery of threatened species, and clear goals and objectives are imperative for assessing their utility. We investigated the short-term (<2 years) success of the first reintroductions of the Extinct in the Wild blue-tailed skink (Cryptoblepharus egeriae) and Lister's gecko (Lepidodactylus listeri) on Christmas Island, by evaluating success criteria considered important for the long-term establishment of species. These short-term criteria included maintain body weight post release, evidence of reproduction within 12 months and evidence of population growth within 12 months. On Christmas Island, we translocated from captivity 307 blue-tailed skinks in two (2017 and 2018) reintroductions and 160 Lister's geckos in a single reintroduction (2019) into a 2600 m2 fenced site that excluded potential predators. In the initial trial for C. egeriae, the translocated population failed to establish, likely due to unsuccessful attempts to exclude an introduced predatory centipede. Centipedes were eliminated at the release site prior to the second trial for C. egeriae, and the skink population tripled by 18 months post-release. The reintroduction trial of L. listeri revealed a significant population decline over 12 months, although site-born individuals were identified. Both species favoured areas with rock and log cover and areas with extensive leaf litter. Our findings provide further evidence that while the reasons underpinning reintroduction success are complex, the use of short-term success stages allows us to identify factors to help refine ongoing reintroductions of these two species into the wild.

High predation rates impact translocations of Leadbeater's possum, a critically endangered arboreal marsupial

Ms Arabella Eyre[1], Dr Dan Harley[1]
[1]Zoos Victoria, Healesville, Australia

Biography:
Arabella is the Leadbeater's possum (LBP) field officer in the Wildlife Conservation and Science team and Zoos Victoria. Arabella completed her Masters of BioSciences at the University of Melbourne studying the distribution of LBP. At Zoos Victoria Arabella is involved in multiple aspects of the LBP field program including translocation.

Leadbeater's Possum (Gymnobelideus leadbeateri) is a Critically Endangered marsupial possum, endemic to Victoria, Australia. The species comprises two genetically distinct populations; highland and lowland. Just 24 lowland individuals persist in the wild at a single locality due to historic habitat loss, ongoing habitat degradation, and inbreeding depression. Captive-breeding has been unsuccessful to date. Successful translocations have been conducted to establish new breeding territories within habitat occupied by the lowland population, however translocations to new localities outside this area are required to increase population size. We present findings from two trial conservation translocations of lowland Leadbeater's possums to new locations, Wallaby Creek and Tolmie. The translocation trial at Wallaby Creek was terminated after three months due to high rates of predation by feral cats. This outcome was not anticipated, as cats were not previously considered a major threat. Predation events were spatially dispersed, and not concentrated around nest boxes or supplementary feeding stations. Despite no predation of possums translocated to Tolmie for the first five months, predation rates subsequently increased, and this trial was terminated after eight months. There were multiple sources of mortality at Tolmie, however the increased predation rate coincided with increased cat activity. These results highlight that introduced terrestrial predators can have major impacts on translocation success for arboreal species. The results from Tolmie also illustrate pronounced temporal variation in predator activity. The next step in recovery of the genetically unique lowland population will require establishment of a 'Safe Haven' where cats and foxes are excluded.

Tracking Success: Using integrated monitoring techniques to assess post-release survival and dispersal in a reintroduction program at Wilsons Promontory, Australia

Mr Beau Fahnle[1], Mr Tom Mabin[1], Ashley Olson[2]
[1]DEECA, Bairnsdale, Australia, [2]Federation University, Churchill, Australia

Biography:
Beau is the project manager of the Eastern Bristlebird Translocation Project which is aiming to set up a second population of the threatened species in Victoria. Beau is a mid career practitioner with a wide base of experience in conservation programs in both Australia and New Zealand

Reintroducing species to their former habitats is a common conservation strategy, but the success of such programs can be hard to gauge without an appropriate monitoring program. The ability to effectively monitor the reintroduced population in the short and medium term is essential to assess the success of the founding population, as well as provide learnings for the

species management and future conservation programs. This case study outlines how an integrated monitoring program was designed to track the progress an Eastern Bristlebird reintroduction project at Wilsons Promontory National Park in south-eastern Australia. The Eastern Bristlebird is a cryptic species that can be difficult to monitor in low densities. By using a combination of VHF telemetry, automated acoustic monitoring, call playback and visual observations we were able to effectively understand the survivorship, dispersal rate, site fidelity and habitat preference of released founders. This three-year program used information gained from each release to inform adaptive management of the program and select future release sites. Our results indicate that the translocated birds from year one and two had high survival rates, showed moderately high site fidelity, and demonstrated preferences for certain habitat types. These findings suggest that the rigorous site selection protocol developed was successful. This case study also outlines how the initial monitoring program will be transitioned into a long term one, using solar acoustic recorders, passive listening, replicable transects, and genetic analysis. The results of the study will contribute to the development of more effective monitoring protocols for future reintroduction programs.

Assessing Reintroduction Strategies and Extinction Risk in the Puerto Rican Parrot

Dr Lisa Faust[1], Brian Ramos Guivas[3], Mrs Sunny Nelson[1], Jafet Velez Valentin[2], Ricardo Valentin[3], Dr Thomas White[2], Ms Tanya Martinez[3]
[1]Lincoln Park Zoo, Chicago, United States, [2]US Fish and Wildlife Service, San Juan, [3]Puerto Rican Department of Natural and Environmental Resources, San Juan

Biography:
Lisa Faust uses population models to help improve conservation decision making for endangered species management, with a special focus on reintroductions and translocations. She leads a team of scientists at Lincoln Park Zoo who collaborate with conservation managers to help improve management decisions that guide species towards recovery.

Designing a reintroduction program requires balancing tradeoffs in resource investment (e.g. captive breeding, post-release monitoring, training, supplemental feeding, etc.), as well as in direct allocation of animals between populations. Population viability analysis (PVA) is a modeling tool that helps practitioners weigh these tradeoffs and assess progress towards recovery targets. We used PVA to evaluate recovery efforts for the critically endangered Puerto Rican parrot (Amazona vittata), which declined to 13 birds and has been the focus of a captive breeding and reintroduction program since 1973. We built an individual-based model of the dynamics of two aviary and three wild populations that are connected via annual releases and parameterized it with detailed demographic data from the last 15 years. We use the PVA to explore risks due to hurricanes, different management strategies for releases, and demographic rates that would lead to successful recovery. If management continues as planned including releases for the next 25 years, the three wild populations have low to moderate risks of extinction of 0.4-31.1% over the next 100 years. Strong growth occurs during the release period, but after management stops all three have declining average stochastic growth rates (range -1% to -5%). This long-term vulnerability is partially due to hurricane risks; without them the wild subpopulations have extinction risks of (0-7%). Our modeling identifies priorities for data collection to better pinpoint the most critical recovery strategies as well targets for management changes that may shift long-term trajectories to stable or growing.

The utility of coded VHF for reintroductions - increasing data densities and welfare outcomes for monitored mammal populations

Mrs Chloe Frick[1], Ms Donell Hole[2], Mr Derek Sandow[3], Dr Liberty Olds[5], Dr Bertram Ostendorf[1], Dr David Taggart[1,4], Dr David Roshier[1,4]
[1]University of Adelaide, Adelaide, Australia, [2]Lotek NZ Ltd, Havelock North, New Zealand, [3]Northern and Yorke Landscape Board, Clare, Australia, [4]FAUNA Research Alliance, Kahibah, Australia, [5]Zoos South Australia, Adelaide

Biography:
My name is Chloe Frick, I am a PhD candidate studying Marna Banggara, a rewilding project located in the southern Yorke Peninsula, South Australia. I am completing my candidature by studying the survival of reintroduced Brush-Tailed Bettongs through studies in telemetry, microbiome, genetics, reproduction, and morphometrics.

As the field of reintroduction biology continues to grow, the demands of monitoring systems have increased. Pulsed VHF radio tracking technology has been used, almost unchanged, to monitor terrestrial vertebrates since the 1960s. Common pulsed VHF can only monitor one individual on each radio frequency, and the number of individuals monitored is limited by the time spent on each frequency and the number of receivers. Coded VHF technology, which uses a digital code to monitor up to 512 individuals on a single frequency, removes these constraints and greatly reduces the time needed to confirm the status of individuals.
Here we demonstrate the utility of coded VHF technologies applied to monitoring a reintroduced population of brush-tailed bettong (Bettongia penicillata) on the Southern Yorke Peninsula in southern Australia. A system of autonomous monitoring towers was able to monitor multiple deployments of coded VFH collars and tail tag deployments over 20 months, recording up to 50 different individuals tags simultaneously without having to change frequency on any of the towers. During a single 24-hour period, one individual was recorded over 24,078 times, creating opportunities for behavioural studies. Key benefits of the high detection rate and autonomous recording are, a timely response to mortalities or a predation event, the detection of nocturnal, cryptic or burrowing species whenever they are active, and the reduced need for personnel to be in the field.

Translocation from insurance populations allows post-fire restoration of Gilbert's potoroo at the site of the last natural population

Dr James Friend[1], Mrs Sarah Comer[2], Dr Saul Cowen[3]
[1]Department of Biodiversity, Conservation & Attractions, Albany, Australia, [2]Bush Heritage Australia, Albany, Australia, [3]Department of Biodiversity, Conservation & Attractions, Woodvale, Australia

Biography:
Tony Friend's career as a conservation scientist commenced with his assignment to recommend management actions to reverse the decline of Western Australia's mammal emblem, the numbat. This led to a wider mission to improve the status of other WA marsupials. He has chaired the Australasian chapter, IUCN Reintroduction Specialist Group.

Gilbert's potoroo was thought to be extinct until its rediscovery in 1994 as a tiny population surviving at Two Peoples Bay on the south coast of Western Australia. Early attempts at captive breeding failed to generate adequate numbers for translocation to new sites, but a wild-to-wild translocation of 10 individuals between 2005 and 2007 to nearby Bald Island resulted in establishment of a new colony. Four years later, 70 individuals were known to be alive on the 810-hectare island. Both populations were used in 2010 to create another insurance population of 25-30 animals in a 380-hectare area which was fenced to exclude introduced foxes and feral cats.

In 2015, a lightning storm following two years of unusually low rainfall caused a large bushfire that left only a handful of animals alive in the 10% of original habitat that was unburnt. Subsequent loss of individuals rendered the Two Peoples Bay functionally extinct.
The restoration of the Two Peoples Bay population is a high priority in the population management strategy for the species. Seven years after the fire, vegetation recovery was sufficient that a trial translocation to assess the suitability of the regenerating habitat was proposed and implemented. Early results show:
1) Despite some predation, survival of individuals has met the established success criteria
2) Individuals spent significantly more time feeding and resting in the burnt area than in unburnt habitat
3) Weight change of recaptured individuals has remained within the success criteria.
Continuation of the population restoration project is proposed.

Translocation in the era of climate change: strategies against acute threats from global warming to reintroduced migratory Northern Bald Ibises

Dr Johannes Fritz[1], BSc. Bernhard Goenner[2], MSc. Regina Kramer[2], Mr Markus Unsoeld[3]
[1]Waldrappteam Conservation & Research, Mutters, Austria, [2]Zoo Vienna , Vienna, Austria, [3]Zoological State Collection Munich, Munich, Germany

Biography:
Johannes is biologist and conservation. In 2002 he founded the company Waldrappteam Conservation and Research and has been running it ever since (www.waldrappteam.at). Since 2014 he is commissioned with the Management of the NBI reintroduction in Europe. Johannes is member of the IUCN SSC Stork, Ibis and Spoonbill Specialist Group.

The reintroduction of migratory Northern Bald Ibises (Geronticus eremita) in Central Europe has been successfully running for over 20 years. The population now consist of more than 200 individuals with breeding colonies north and south of the Alps. They have been reproducing since 2011 and by now 250 offspring have fledged in the wild.
The birds are regularly migrating to a common wintering site in Tuscany, Italy. However, we have observed that autumn migration starts progressively later over the years. This trend, obviously exogenously induced and directly related to the increasingly extended autumnal warm spells, causing more and more birds from the Northern Alpine Foreland to fail in crossing the mountain barrier. We ultimately have to capture and transfer them to the southern edge of the mountains, to avoid significant losses during winter.
Thus, climate change is increasingly threatening the autonomous survival of the colonies north of the Alps. Our mitigation strategy is to significantly expand the project. In 2023, we start establishing a second migration route without the Alpine barrier over 2.300 kilometres to a wintering site in Andalusia, Spain, in the area of another sedentary release population (Proyecto Eremita). Human-led migration is used as the release method. The fusion with the Andalusian birds should eventually lead to a pan-European population which can react with greater flexibility to the consequences of climate change.
The measures and experiences of this long-lasting European project provide important implications for other translocation projects in times of climate change.

Assessing a trail translocation of the endangered pygmy bluetonue lizard: does source location affect outcomes?

Professor Mike Gardner[1], Ms Dee Trewartha[1]
[1]Flinders University, Bedford Park, Australia

Biography:
Mike Gardner lab studies the conservation, evolutionary ecology, and genetics of lizard species. He overseas a long term research program on two species, the sleepy lizard and the endangerd pygmy bluetongue lizard. His philosphy involves studying the intricacies of the natural world to instil a sense of awe and wonder.

The endangered pygmy bluetongue lizard is under threat from climate change. These lizards spend most of their life inside or at the entrance of vertical burrows dug by spiders, and only persist in unploughed land in the agricultural belt (Mid-North) in South Australia. The lizards have now in a limited distribution in a few isolated remnant fragments of a once more extensive native grassland habitat, predominantly located on private land. In the longer-term, the research suggests the PBT's geographical range will contract significantly under a number of climate change scenarios, but that suitable habitat will be available south of the current range. We have time to determine how to undertake translocations with the goal of understanding how to move the species to areas further south. In 2020 we conducted a trial translocation moving over 100 lizards from the northern, mid, and southern edge of their range to an area outside the current range but at the same latitude as the southernmost population. Additionally, some lizards of mixed parentage were also moved. Here I will discuss if lineage type (source locality and mixed or pure) influences survival, health (e.g. body condition) and reproduction following translocation following three seasons of the translocation. Additionally, how the time of year (autumn or spring) that the translocation took place affected these parameters will be discussed.

A web-based app to simulate the conservation translocation of beavers

Dr Martin Gaywood[1], Dr Zelda Van der Waal[2], Prof Aileen Mill[2]
[1]NatureScot, Dingwall, United Kingdom, [2]Newcastle University, Newcastle upon Tyne, United Kingdom

Biography:
Martin is the Species Projects Manager at NatureScot. He has been involved in beaver reintroduction since 2000, is secretariat for the National Species Reintroduction Forum, developed the Scottish Code for Conservation Translocations, was lead editor of 'Conservation Translocations' published by CUP and is a member of the IUCN SSC CTSG.

The wide scale restoration of Eurasian beaver (Castor fiber), is currently underway in Scotland. A number of conservation translocations have been carried out, and more are planned. These have be carried out in line with the Scottish Code for Conservation Translocations, and the relevant biological and socio-economic considerations addressed. The species is a significant ecosystem engineer that can change aquatic, semi-aquatic and riparian habitats, alter physical processes and benefit biodiversity and cultural ecosystem services. Their engineering activities can sometimes also have adverse impacts on land management and infrastructure.

We developed a web-based app to help the complex planning and design of these projects. The app is based on a beaver landscape population model that simulates beaver ecology and behaviours to predict spatial spread through time. The app allows the user to create scenarios by inputting the numbers of beavers to release, their family structures and their locations to simulate the size and spread of the predicted beaver population over three, five and ten years periods. Model predictions are summarised and mapped.

The expectation is that the app will developed further in collaboration with nature conservation agencies to aid in assessing conservation translocation plans and licence applications, and practitioners designing appropriate release strategies. The visual outputs may also be used

during engagement with local communities, to help explain the nature of any proposed translocations, and their possible implications.

The use of molecular techniques to investigate how Eurasian beavers (Castor fiber) shape ecological communities

Mr James Macarthur[1], Dr Martin Gaywood[2,1], Dr Victoria L. Pritchard[1], Miss Dasha Svobodova[1], Dr Barbara Morrisey[1], Dr Nathan P. Griffiths[1], Mr Chris Conroy[4], Prof Colin W. Bean[3], Dr Lori Lawson Handley[5], Mr Shaun Leonard[6], Dr Bernd Hänfling[1]
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Biography:
James Macarthur is a PhD student with a particular interest in integrating molecular techniques into biodiversity monitoring and management frameworks. His PhD will integrate both molecular and traditional techniques to investigate the impacts of the Eurasian beaver (Castor fiber) on migratory fish species and conservation priority mammals,

The conservation translocation of keystone species is considered part of the solution to the current biodiversity crisis. The Eurasian beaver (Castor fiber) is one such species, shaping their habitat by felling trees and building dams, creating nutrient rich ponds, and slowing the flow of water. The creation of these heterogenous habitats is a primary motivation behind beaver reintroductions. However, while their potential benefits to aquatic biodiversity and ecological functioning have been widely promoted, concerns arise surrounding the passability of dams for migratory fish species, and the impacts that changes in flow rates and sediment transport may have on salmonid spawning habitats. In 2021, the Scottish Government announced a change in policy on beavers in Scotland, which supported the translocation of individuals to suitable habitats to support the growing population. Therefore, the need for robust ecological data on the impacts of beavers on their environment is greater than ever. Modern molecular techniques enable researchers to sequence environmental DNA (eDNA) from water samples which provides a cost-effective method to monitor whole communities and map out species distributions across a large catchment. This research will incorporate eDNA water sampling to collect both baseline ecological data prior to the translocation of beavers, and catchment wide data from established beaver populations across the Scottish Highlands, which will provide novel insights into how keystone species shape ecological communities. Thus, allowing more holistic and targeted management plans to be developed and implemented moving forward which will benefit both salmonids and beavers.

Finding a way forward for complex conservation translocations - Scotland's Beaver Strategy 2022-2045

Dr Martin Gaywood[1], Mr Jamie Copsey[2]
[1]NatureScot, Dingwall, United Kingdom, [2]IUCN SSC Conservation Planning Specialist Group, Falmouth, United Kingdom

Biography:
Martin is the Species Projects Manager at NatureScot. He has been involved in beaver reintroduction since 2000, is secretariat for the National Species Reintroduction Forum, developed the Scottish Code for Conservation Translocations, was lead editor of 'Conservation Translocations' published by CUP and is a member of the IUCN SSC CTSG.

Scotland's Beaver Strategy 2022-2045 sets out a route map for action over the coming decades. Its development involved more than 50 organisations from across government and non-government bodies, land management, environmental, and other sectors, using an approach facilitated by the IUCN SSC Conservation Planning and Specialist Group. This ambitious, forward-looking strategy for managing and restoring an ecosystem engineer is one of the first of its kind in Britain.

The reintroduction of the Eurasian beaver (Castor fiber) to Scotland has been a major topic of debate since the mid-1990s. Initial assessments of feasibility and desirability were followed by a trial translocation in Argyll in 2009, the first licensed reintroduction of a mammalian species in Britain. In the meantime, there were increasing numbers of reports of beavers resulting from accidental escapes or unauthorised releases. In November 2021 the Scottish Government announced support for more conservation translocations and wider beaver restoration.

Throughout this time views and experiences have differed markedly between stakeholders. Many beaver supporters have highlighted the benefits they can bring, with aspirations for wider restoration. Others have voiced their concerns over the impacts of beaver activities on certain land uses, conservation interests and fisheries. Conflict has sometimes been intense. The collaborative production of Scotland's Beaver Strategy in 2022, 'owned' by the stakeholders, was therefore timely and necessary. It draws on research and our experiences of living with beavers and reflects the aspirations and concerns of stakeholders as wider restoration begins. New conservation translocations are now underway and planned.

Mitigation translocations: the ugly stepsisters of the translocation world

Dr Jen Germano[1], Dr Laurence Barea[1], Ms Kim Field[3], Dr. Jim Foster[4], Dr. Simon Clulow[6], Ms. Gemma Harding[2], Dr. Richard Griffiths[2], Professor Bill Bateman[7], Dr Holly Bradley[7], Dr. Ron Swaisgood[5]
[1]Department of Conservation, Nelson, New Zealand, [2]University of Kent, Canterbury, UK, [3]US Fish and Wildlife Service, Reno, USA, [4]Amphibian and Reptile Conservation, Whitley, UK, [5]San Diego Zoo Wildlife Alliance, Escondido, USA, [6]University of Canberra, Canberra, Australia, [7]Curtin University, Perth, Australia

Biography:
Jen is an ecologist at the New Zealand Department of Conservation. She has been involved in translocations for 20 years. She has led three international symposia on herpetofauna translocations, a special issue of Animal Conservation on herpetofauna translocations and is co-leader of the IUCN ASG Translocation Working Group.

Despite rapid growth in the field of conservation translocations, results from scientific research are often not applied to translocations initiated when human land-use change conflicts with the continued persistence of a species' population at a particular site. Such mitigation-driven translocations outnumber and receive more funding than science-based conservation translocations, yet the conservation benefit of the former is unclear. Because mitigation releases are economically motivated, outcomes may be less successful than those of releases designed to serve the biological needs of species. Translocation as a regulatory tool may be ill-suited for biologically mitigating environmental damage caused by development. Evidence suggests that many mitigation-driven translocations fail, although the application of scientific principles and best practices would probably improve the success rate. Lack of transparency and failure to document outcomes also hinder efforts to understand the scope of the problem. If mitigation-driven translocations are to continue as part of the growing billion-dollar ecological consulting industry, it is imperative that the scale and effects of these releases be reported and evaluated. There is also a need to develop and pursue other tools to help minimise, mitigate, and offset for the loss of habitat and wildlife if we expect these species to survive in the face of a growing global human population.

A small drop of blood for a sea of information: Using genetics to inform western grasswren translocation strategies

Ms Aline Gibson Vega[1,2], Dr Michelle Hall[1,3], Dr Amanda Ridley[1], Dr Allan Burbidge[2,4], Dr Saul Cowen[1,2]
[1]University of Western Australia, Crawley, Australia, [2]Department of Biodiversity, Conservation and Attractions, Kensington, Australia, [3]Bush Heritage Australia, Melbourne, Australia, [4]Edith Cowen University, Joondalup, Australia

Biography:
Aline Gibson Vega was a PhD student at the University of Western Australia when undertaking this work. Her interests lie in applied conservation science

Conservation translocations are prone to failure due to their complexity in design and execution. Lack of species-specific knowledge to guide the development of translocation strategies is one of the key difficulties faced by conservation managers. However, obtaining this information can be difficult, particularly for species which inhabit remote areas or are difficult to observe.

Western grasswrens were translocated from mainland Shark Bay to Dirk Hartog Island, Western Australia in October 2022. Prior to this translocation, there was limited information about the breeding biology, behavioural ecology and no information on population genetics for this cryptic species. Hence, well-informed species-specific translocation strategies could not be developed. Due to the challenges of direct observation and remote location, obtaining blood samples for genetic sequencing was thought to be an effective way to rapidly learn multiple ecological aspects about this species.

We used genetic analysis to obtain a better understanding of the genetic mating system, infer dispersal capabilities, and determine population genetic structure of the last remaining population of western grasswren in Western Australia. Our results have directly aided in the development of several translocation strategies such as 1) where to source individuals, 2) how many individuals to source, 3) the implications of sourcing whole groups versus part of a group, and 4) capture and release designs. In addition, SNPs allowed for the first genetic estimation of source population size through extrapolating from effective population size. This case study highlights how gathering genetic data can greatly assist in making evidence-based translocation strategies for cryptic species.

Using life history, habitat suitability modeling, and genetics to inform conservation actions of an isolated subpopulation of endangered Canadian butterfly

Dr James Glasier[1], Dr. Zachary MacDonald[2], Dr. Julian Dupuis[3], Robert Sissons[4], Natasha Lloyd[5], Dr Axel Moehrenschlager[5], Dr. H. Bradley Shaffer[2], Dr. Felix Sperling[6]
[1]Wilder Institute/ Calgary Zoo, Calgary, Canada, [2]University of California Los Angeles, Los Angeles, United States of America, [3]University of Kentucky, Lexington, United States of America, [4]Parks Canada, Waterton Lakes National Park, Canada, [5]International Union for Conservation of Nature, Gland, Switzerland, [6]University of Alberta, Edmonton, Canada

Biography:
Passionate about scientific discovery, James received a B.Sc. in Palaeontology and an M.Sc. in Conservation Biology from the University of Alberta. He then travelled to Australia to study for his

Ph.D. in Biology from the UNSWs. He is a now Population Ecologist at the Wilder Institute, in Alberta, Canada.

Uncertain genetic distinctiveness of populations may affect the need and source of potential conservation translocations, while habitat suitability is integral for the development of feasible release strategies. The half-moon hairstreak (Satyrium semiluna) is an endangered butterfly with a limited range in Canada. It is found at eight localities in the province of British Columbia and one in the province of Alberta. In Alberta, half-moon hairstreaks are only found in a small area of about 3 km2, in Waterton Lakes National Park, making it susceptible to extirpation from natural disturbances and other threats such as the invasive plant spotted knapweed (Centaurea stoebe). Although endangered, the Waterton Lakes half-moon hairstreak population's life history, ant-associations, host plant preferences, and genetic uniqueness have never been studied; a greater understanding of these features is integral for its conservation. We surveyed the population density of both larva and adult half-moon hairstreak's from 2020-2023 in relation to host plant density and ant species abundance. Our habitat suitability model will help to guide habitat management of the current population and assess the potential for assisted colonization. Half-moon hairstreak larvae have high host-specificity for both plant and ant species, only associating with a single species. This limits potential care and translocation options, such as assisted colonization or population augmentation. We also compared the full genome of the Waterton Lakes half-moon hairstreak population to other populations. The Waterton Lakes population is genetically distinct from the closest populations of this species found ~450km away in British Columbia and Montana, which increases the need for unique conservation actions. Both the habitat suitability model and genetic results are already being used to inform future conservation actions. Both the habitat suitability model and genetic results are already being used to inform future conservation actions.

Fitness consequences of weakened anti-predator responses: experimental release of havened and non-havened woylies (Bettongia penicillata ogilbyi) to inform conservation management

Ms Natasha Harrison[1], Prof Ben Phillips[3], Prof Nicola Mitchell[1], Dr Adrian Wayne[1,2]
[1]University Of Western Australia, Fremantle, Australia, [2]Biodiversity and Conservation Science, Department of Biodiversity, Conservation and Attractions, Manjimup, Australia, [3]School of BioSciences, University of Melbourne, Parkville VIC 3010, Australia, Parkeville, Australia

Biography:
Tash Harrison is a conservation biologist and behavioural ecologist completing her final PhD year at the University of Western Australia. She has worked to quantify the loss of anti-predator traits from havened populations of mammals, investigate drivers of such losses, and reveal any survival consequences of weakened anti-predator responses.

Because invasive predators pose a threat to Australian mammals, we are increasingly preserving threatened populations within predator-free havens. Havened populations are commonly used as source populations for translocation, but many translocations of havened populations have failed. In the absence of predators inside havens, havened mammals can lose their anti-predator traits, and it is predicted that individuals with such weakened anti-predator responses should have reduced survival and reproduction when faced with predators, though few empirical tests of this theory exist. We conducted an experimental release whereby 40 havened and 40 non-havened woylies (Bettongia penicillata ogilbyi; Australia's most translocated species) were translocated to an area of vacant bushland where they are exposed to a low density of foxes and feral cats. For one year, we have monitored fitness and behaviour among these two cohorts from

which we will draw comparisons between the predator naïve havened population and the predator exposed non-havened population, describing any adaptive changes in anti-predator responses over time. We will also compare rates of survival and reproduction in the havened and non-havened populations to evaluate the suitability of the havened population for future translocations. These findings can directly inform translocations of this and other populations of havened mammal to ensure the best survival outcomes. Our study paves the way toward a conceptual and mechanistic understanding of the loss of anti-predator responses, which is essential if we are to aim for the persistence of havened species outside of predator-free havens.

Maximising reintroduction success while minimising impacts to source populations: a strategy of small release group and soft-release

Dr Genevieve Hayes[1], Dr Katherine Tuft[1], Associate Professor Katherine Moseby[1,2]
[1]Arid Recovery, Olympic Dam, Australia, [2]University of New South Wales, Sydney, Australia

Biography:
Genevieve is the Ecologist at Arid Recovery, an NGO in arid Australia. She has expertise in arid zone ecology, particularly with small, carnivorous mammals, and a keen interest in conservation genetics and its importance for the long-term persistence of threatened species.

A major challenge facing translocations is limited knowledge of source populations. Maximising the benefit to the translocated population while minimising risk to their source population is critical. Kowaris, Dasyuroides byrnei, are a dasyurid mammal that occur in a restricted range in arid central Australia, where their populations are highly fragmented and exist largely on cattle grazing leases. There is limited knowledge of kowari biology and ecology in the wild, and modelling suggests they have a 20% chance of extinction within the next 20 years, leading to recommendations for the species to be represented in fenced safe havens. In 2022, we translocated 12 adult kowaris to Arid Recovery, the largest feral predator-proof, fenced reserve in Australia. However, the land surrounding Arid Recovery supports abundant feral cats and cattle, the two major threats to kowaris in the wild. If kowaris exhibit hyper-dispersal, a trait common in other dasyurids, this could significantly increase mortality rates in the translocated population. To combat hyper-dispersal and minimise the number of animals taken from the wild, we targeted females with pouch young and initially contained animals in soft-release pens. This approach successfully established the kowaris within the 2,600ha area, with only one female dispersing beyond this area before denning young. Females travelled less than 2km on average in the first few months and maintained high site fidelity thereafter. Dispersing young that are vulnerable in the wild have thrived within the fenced reserve. Our approach ensured a successful translocation while simultaneously minimising the impact on the wild population.

The future is here - an easy-to-use toolkit for integrating genetics into conservation management

Professor Carolyn Hogg[1], Dr Parice Brandies[2], Dr Katherine A. Farquharson[1,3], Dr Kym Ottewell[4], Prof Katherine Belov[1,3]
[1]The University of Sydney, The University of Sydney, Australia, [2]RONIN, Canberra, Australia, [3]ARC Centre of Excellence for Innovations in Peptide & Protein Science, The University of Sydney, Sydney, Australia, [4]Department of Biodiversity, Conservation & Attractions, Perth, Australia

Biography:
Dr Carolyn Hogg is a conservation biologist who has been working with threatened species for over 25 years. Carolyn is the Science Lead for the Threatened Species Initiative, a program generating

genomic resources for Australia's threatened species, and co-lead of the Australasian Wildlife Genomics Group at the University of Sydney.

Over the past decade, the development of genetic and genomic tools for conservation management have come forward in leaps and bounds. Once considered a "nice to have", genetic data is fast becoming an essential item for informing and managing translocations. However, due to the complexity of the field, easily using genetic data for decision-making and monitoring remains beyond the reach of most managers and conservation biologists. In May 2020, we launched the Threatened Species Initiative (TSI), a program designed to generate genomic resources for Australia's threatened species. Critical to the project is not only the generation of reference genomes and population genetic data but an online portal for conservation managers. The toolkit is a "one stop shot" from collecting samples to generating and analysing genetic data to an easily interpretable genetic management report. The TSI analysis portal is a point and click web interface where you can pull in the raw sequence data and select the population genetic information you need for management decisions, and the system will run the analysis for you and produce a standardised report. We will show how the current toolkit works and provide case study examples for how it is being used to inform translocations and the management of threatened species.

The Mulligans Flat-Goorooyarroo Woodland Experiment: using multi-species reintroductions to enable whole-ecosystem restoration

Cassandra Holt[1], Prof Adrian D. Manning[1], Dr Iain Gordon[1,2,3,4], Dr Linda Neaves[1], Dr Maldwyn J. Evans[1], Mx Belinda Wilson[1], Ms Brittany Brockett[1], Ms Kiarrah Smith[1], Shoshana Rapley[1], Jenny Newport[1]
[1]The Australian National University, Acton, Australia, [2]Central Queensland University, Townsville, Australia, [3]CSIRO, Townsville, Australia, [4]James Hutton Institute, Craigiebuckler, UK

Biography:
Cassandra supports a variety of projects relating to translocation science and coexistence conservation strategies, with the aim of improving outcomes for threatened species recovery in the exotic predator-proof sanctuary setting and beyond. She has contributed to translocations of western quolls, eastern quolls, eastern bettongs, bush stone-curlews, and New Holland mice.

The 'Mulligans Flat – Goorooyarroo Woodland Experiment', situated in Canberra, Australia, represents a research partnership between the Australian Capital Territory Government, the Woodlands and Wetlands Trust, and several research institutions. The Experiment aims to enhance critically endangered box-gum grassy woodland for biodiversity by manipulating ecological processes within the exotic predator-proof Mulligans Flat-Goorooyarroo Woodland Sanctuary, which serves as an 'outdoor laboratory'.

The Experiment provides a research framework for a comprehensive understanding of these grassy woodlands, addressing the breakdown of trophic webs and ecosystem function within this once-common community using a whole-ecosystem approach. This trophic rewilding experiment has included everything from restoration of the soil biome and invertebrate diversity, to a multi-species translocation program of ecosystem engineers, native predators, and more.

In this presentation I offer an overview of the experiment 18 years on, underscoring the importance of a holistic approach to community restoration and employing functional reintroductions as a tool. I will provide insight into our translocations to date and how our long-

term research program has facilitated the development of practical tools and methods to improve the effectiveness of translocations 'beyond-the-fence'.

Last chance to save a unique population: Supplementing the NSW Endangered Coastal Emu (Dromaius novaehollandiae)

Lia Hooper[1], Dr Melissa Giese
[1]NSW Department of Planning and Environment, Coffs Harbour, Australia

Biography:
Lia is a Threatened Species Officer with the NSW Saving our Species Program. She has diverse experience in conservation ecology and is working on various projects to improve outcomes for threatened species. She is currently leading the recovery of the NSW Endangered Coastal Emu, including a pilot captive breeding program.

The Coastal Emu Endangered Population is a range-restricted, genetically distinct population found in north-eastern NSW. Once widespread, this population is now estimated to fewer than 50 birds. A recent genetic investigation confirmed that without urgent intervention, the population is at risk of extinction within 50 years.

A key threat to persistence in the wild is low recruitment, largely due to egg and chick predation. A captive breeding and translocation program commenced in 2022 to establish an insurance population, where eggs are collected from the wild and raised in captivity. Once chicks reach a size that minimises risks of predation, they will be released back into the environment, where movement and survival will be monitored. With so few individuals remaining, this is seen as the last opportunity for recovery of this unique population.

This is an ambitious project with many novel challenges. The species persists at very low densities within a highly dispersed population. Thermal drone technology is needed to locate active nests across the landscape. Project success relies on strong partnerships with multiple stakeholders. This includes commercial emu farmers, private landowners who are providing predator-free soft-release sites, the local Aboriginal community, for which emu holds both traditional and contemporary significance, and the non-Aboriginal community, which has developed a high degree of ownership of the emu population.

We present our solutions and preliminary results, including successful application of drone technology, our partnerships with local Aboriginal communities and landowners, and our approach to monitoring captively bred chicks as part of post-release monitoring.

Using molecular analysis of scats to inform mammal conservation

Dr Anna Hopkins[1], Ms Shannon Treloar[1], Ms Rachyl-anne Stover[1], Dr Robert Davis[1], Dr Kym Ottewell[2], Dr Cheryl Lohr[2], Dr Saul Cowen[2], Dr Leonie Valentine[3]
[1]Edith Cowan University, Joondalup, Australia, [2]Department of Biodiversity Conservation and Attractions, Kensington, Australia, [3]WWF, Perth, Australia

Biography:
Dr Anna Hopkins is a Senior Lecturer and co-lead of the Molecular Ecology and Evolution Group at Edith Cowan University. Her work focusses on the use of molecular tools to support conservation and biodiversity management.

Globally, biodiversity loss is a key environmental threat caused primarily by loss of habitat and the introduction of exotic species. Australia has one of the highest extinction records in the world for mammals, with 30 mammal species now extinct. Translocations to closed systems such as fenced reserves are commonly used for the conservation of threatened fauna worldwide and although fenced reserves can provide significant conservation benefits to biodiversity, such closed systems require close monitoring. Molecular analysis of scat is increasingly being used as a non-invasive and reliable method for monitoring fauna. This presentation outlines two case studies from Western Australia with contrasting applications of molecular analysis of scats from threatened mammals. The first case study outlines the use of mammal DNA from scats as a tool for monitoring population growth and distribution in the trap shy mala (rufous hare-wallaby) in a reintroduced population. The second case study uses scat DNA to examine resource competition between two threatened mammals reintroduced into a predator-proof enclosure. The advantages of molecular analysis of scats for monitoring will be discussed as well as outlining areas where further research is required.

Reintroduction strategies for the conservation of the Southern Corroboree Frog; the use of fences to exclude pathogens

Dr David Hunter[1], Mr Michael McFadden, Mr Deon Gilbert, Mr Damien Goodall
[1]NSW Department of Planning and Environment, Glenroy, Australia

Biography:
David Hunter is a threatened species officer for the New South Wales State Government, and has implemented conservation programs for critically endangered frogs over the past 25 years. Dave currently manages programs for five threatened frogs where captive breeding and reintroductions are key actions.

The Southern Corroboree Frog (Pseudophryne corroboree) is restricted to a small area of the Snowy Mountains in South-eastern Australia and would be extinct if not for a captive breeding and reintroduction program. Establishing self-sustaining populations in the wild is challenging, as the key threat of disease caused by infection with the Amphibian Chytrid Fungus cannot be directly mitigated. Accordingly, the short to medium term (next 20 years) reintroduction objectives are focused on integration with the captive breeding program to maintain genetic variability and field fitness. Multiple release strategies are currently being trialled, which includes releases into areas occupied by reservoir host species for the Amphibian Chytrid Fungus, and a novel approach of using fenced areas to exclude reservoir hosts. As would be expected, eggs and frogs released into habitat occupied by reservoir hosts achieves low annual survivorship (< 0.25) through to sexual maturity. Frogs released into small enclosures (30m2) that exclude reservoir hosts can be maintained pathogen free, although annual survivorship (0.5) is currently insufficient, and successful breeding has not been achieved. Frogs in the large enclosures (>200m2) can be maintained pathogen free, and consistently breed, however not all mature males engage in calling activity, and the proportion of females mating each year is variable. The results thus far demonstrate the value of using fenced areas to maintain pathogen free colonies of the Southern Corroboree Frog in the wild, and with improvements, are likely to achieve current objectives for the broader recovery program.

Plant translocations: Ensuring long-term success by understanding the influence of habitat in a changing world and applying effective success criteria

Ms Nadline Kjelsberg[1], Dr Eva Malecore[2], Dr Filipa Coutinho Soares[3], Professor François Sarrazin[4], Professor Bruno Colas[5], Dr Jean-Baptiste Mihoub[6], Prof Markus Fischer[7]
[1]Institute Of Plant Sciences, University Of Bern, Bern, Switzerland, [2]Botanical Garden of the University of Bern, Bern, Switzerland, [3]National Museum of Natural History, Centre for Ecology and Conservation Sciences, Paris, France, [4]University of Sorbonne, Centre for Ecology and Conservation Sciences, Paris, France, [5]University of Paris-Saclay, CNRS, AgroParisTech, Systematic Ecology and Evolution, Gif-sur-Yvette, France, [6]University of Sorbonne, Centre for Ecology and Conservation Sciences, Paris, France, [7]Institute of Plant Sciences, University of Bern, Bern, Switzerland

Biography:
Nadline completed a Master program in nature conservation and ecology that she set up between the University of Neuchâtel, Switzerland, and the University of Technology Sydney, Australia. She is now a PhD student studying ecosystem restoration and reintroductions at the University of Bern.

Plant species reintroductions for the restoration of valuable habitats can only be achieved if the success is ensured over the long-term. This can be accomplished with adequate monitoring and understanding of interactions between the species we target for reintroductions and their habitats that have been heavily modified through time due to human activities. We want to increase the proportion of translocations reaching self-sustainability by providing monitoring guidelines completing the IUCN ones by reviewing success criteria used worldwide and assessing their relevance according to the species' life history traits and timeframe. We aim to fill the lack of defined success criteria reported by previous studies with accurate success criteria embedded in an unifying framework taking into account the population dynamics in order to make monitoring a powerful tool for restoration. We review various translocations not only to create relevant monitoring guidelines but also to create a database to improve collaborations and knowledge sharing. Concerns are additionally rising about habitat quality and previous failures in translocations due to unsuitable sites with no further investigation conducted to improve the current knowledge status. We take advantage of the different biogeographical regions in Switzerland to revisit successful and unsuccessful old translocation sites which were anthropized and restored and compare the target species optimum values for various factors with the current conditions on site to see how it influences the populations' viability. We investigate the influence of habitat's quality on plant reintroductions playing a role in their long-term success with growing importance in a changing world.

Why should we give a rats? Opportunities, challenges and benefits in the application of an Australian rodent disease risk analysis

Ms Fiona Knox[1,2], Dr Saul Cowen[1], Dr Colleen Sims[1], Professor Kristin Warren[2], Dr Lian Yeap[2], Dr Rebecca Vaughan-Higgins[2]
[1]Department of Biodiversity, Conservation and Attractions, Perth, Australia, [2]Murdoch University, Perth, Australia

Biography:
Fiona Knox is a qualified veterinarian and has been working with the Department of Biodiversity, Conservation and Attractions as a veterinary resident in wildlife population health for the Dirk Hartog Island ecological restoration project. She is a professional doctorate candidate at Murdoch University.

Conservation translocations carry an inherent disease risk. Rodent translocations are arguably of particular risk as their life-history traits make them ideal disease reservoirs. However, currently there is a poor understanding of the baseline health of Australian rodents, especially for species inhabiting semi-arid and arid environments where assumptions of equivalence with

mesic counterparts are inappropriate. Although deficiencies in baseline knowledge pose challenges for wildlife disease risk analyses (WDRA), the WDRA process can provide an opportunity to identify how translocations and attached ecological monitoring programs may begin to address these knowledge gaps. Early planning and collaboration enabled the implementation of recommendations from the Dirk Hartog Island rodent translocation WDRA. A three-year project involving targeted and passive disease surveillance of source and recipient rodent populations was established. We focussed on both translocated and extant rodents to ascertain baseline health data prior to and during translocation. Through this project we have increased our understanding of pathogen diversity and possible health implications in semi-arid and arid-zone murids. Our results emphasise the need for ongoing island biosecurity and hygiene vigilance for both wildlife and human health, and identified non-infectious hazards that may require more intensive risk mitigation. Several challenges were encountered, including species size, absence of validated diagnostic tests, and logistical challenges. However, the project has demonstrated the value of incorporating WDRAs and allocating resources to health and disease monitoring to maximise the knowledge gained from translocation programs.

Measuring and managing genetic erosion in plant translocation: lessons from Grevillea scapigera

Dr Siegy Krauss[1]
[1]Kings Park Science, DBCA, Kings Park, Australia

Biography:
Siegy Krauss is a principal research scientist in ecological genetics at Kings Park and Botanic Garden (DBCA). He applies genetic tools and genetic thinking to issues underpinning practical outcomes in plant conservation and restoration ecology.

Plant reintroductions typically start from a limited genetic base. When that genetic base is known, an opportunity to quantify genetic erosion and test the genetic consequences of small founding population size through generations in a natural experiment is enabled. The Corrigin Grevillea, G. scapigera, has been the focus of a sustained recovery program for over 25 years. Translocation trials were first established in 1996 with what were thought to be equal numbers of 10 genets, ramets of which were propagated by tissue culture. Subsequent plantings occurred in following years, largely from seed harvested at this site. Flowering and natural seed set has been very high in all years, and some natural recruitment occurred in most years. In 1998, 2007, 2012 and 2021 we genotyped plants and a sample of their seed to assess genetic fidelity and genetic erosion over multiple generations.
Following establishment, we found that eight genets, not ten, were present, that 54% of all plants were a single genotype, and the F1's were on average 22% more inbred than their parents. The genetic consequences of this initial dramatic erosion on descendents 20 years later will be presented. A positive association between survivorship and increasing genetic dissimilarity of parents of seedlings indicates inbreeding depression associated with genetic erosion. Our results highlight that rapid genetic erosion may be a feature of many small, translocated populations, which may ultimately threaten their long-term survival. Strategies to prevent genetic decline in rare species translocations are discussed.

Hydroperiod positively influences translocation success of captive-bred juvenile western swamp tortoises (Pseudemydura umbrina) at three translocation sites

Dr Gerald Kuchling[1]
[1]Western Australian Department of Biodiversity, Conservation and Attractions, Swan Coastal District, Wanneroo, Australia

Biography:
As principal investigator of the western swamp turtle recovery team and its predecessor Gerald Kuchling, PhD University of Vienna 1979, set up a successful western swamp turtle captive breeding program from 1988 to 1991 (since then continued by Perth Zoo). Since 1994 he conducts translocations primarily of captive-bred juveniles.

Pseudemydura umbrina (western swamp tortoise) is a small (males <500g, females < 320g) cryptic freshwater turtle with a long juvenile period (8-15 years) and a lifespan of up to 100 years. The species occurs naturally in a Mediterranean-type climate, in shallow seasonal and ephemeral clay or sand-over-clay-based swamps with a low mid-story canopy and is active during winter and spring. During summer and autumn, western swamp tortoises aestivate mainly underground in surrounding bushland. By the late 1980s only a single, self-sustaining wild population persisted (~30 individuals). A successful captive breeding program has been ongoing since 1988. Captive-bred juveniles (2-4yrs old, >90g) were translocated to three sites inside the species' likely historical range multiple times from 1994, 2000 and 2007 onwards. Despite inconsistent monitoring at the three sites, some trends were observed. The percentage of juveniles that reached maturity (released prior to 2015; more than 135 per site) varied from 14.04% to 22.06%, according to the release site. The hydroperiod of wetlands was the main habitat characteristic found to be positively correlated with translocation success. Over the last 29 years, increasing aridity due to climate change has progressively degraded the integrity of these habitats. Translocations were more successful at sites where at least some associated wetlands overflow during winters with average or above average rainfall. This buffers, to some degree, hydroperiod decline and shortening of western swamp tortoise activity seasons in winters with below-average rainfall.

The role of animal translocations in the restoration of Gorongosa National Park in Mozambique

Mr Luís Miguel Lajas[1], Marc Stalmans[1], António Paulo[1], Mércia Ângela[1], Elias Mubobo[1]
[1]Gorongosa National Park, Mozambique

Gorongosa National Park is a 4,000 km2 protected area located at the southern end of Africa's Great Rift Valley in Mozambique. Historically, on account of its rich soils and abundant water, it had one of the highest densities of large wildlife on the continent. However, the Mozambican Civil War that lasted for 16 years resulted in the loss of 85 to 90% of the Park's large wildlife. In 2004, the Carr Foundation initiated the Gorongosa Restoration Project and signed a long-term co-management agreement with the Government of Mozambique to protect and restore the Park. Since then, large herbivore populations have largely rebounded from remnant populations. Less than 500 ungulates were introduced, but these played an outsized role in the recovery of especially African buffalo and blue wildebeest. Similarly, the lion population recovered through improved protection, but the re-introduction of African wild dogs, leopards and spotted hyena's was essential to their recovery as these species had been extirpated. In 2018, the first rehabilitation project in Mozambique for the Temminck's pangolin was established. Since then more than 100 individuals have been rescued from the illegal wildlife trade and have been rewilded.

Saving Wildcats: restoring wildcats in Scotland through captive breeding and threat mitigation

Dr Keri Langridge[1], Mr David Barclay[1], Dr Alice Bacon[1], Dr Ian Simpson[1], Dr Martin Gaywood[2], Dr David Hetherington[3], Mr Kenny Kortland[4], Dr Helen Senn[1]
[1]Royal Zoological Society of Scotland (Saving Wildcats), Kingussie, Scotland, [2]NatureScot, Inverness, Scotland., [3]Cairngorms National Park Authority, Grantown, Scotland., [4]Forestry and Land Scotland, Inverness, Scotland.

Biography:
Dr Keri Langridge has worked with Saving Wildcats as the In-situ Conservation Manager since the project began in 2020. Keri has worked in wildcat conservation in Scotland since 2015, and trained as a research scientist with a background in Behavioural Ecology and Animal Behaviour.

Wildcats in Scotland are a critically endangered sub-population of the European wildcat (Felis silvestris) and are the last remaining wild felid species in the UK. The main threats to the wildcat in Scotland are habitat loss, prey decline, and persecution from gamebird management, which have substantially reduced and fragmented populations, driving increased hybridisation with domestic cats. Despite a series of dedicated conservation projects, an independent status review by the IUCN Cat Specialist Group in 2019 concluded that the wildcat population was no longer viable without reinforcement from captive populations. In response to this crisis, the EU LIFE funded Saving Wildcats partnership project (2020-2026) was developed, led by the Royal Zoological Society of Scotland (RZSS). Saving Wildcats will conduct the first trial releases of sixty wildcats into a prepared release site in the Cairngorms National Park between 2023-2025, with the aim to establish a population. The dedicated captive breeding for release facility was built at the RZSS Highland Wildlife Park between 2020-2022, with the first litter of twenty-two kittens born in Spring 2022. Pre-release surveys of the release site confirmed low risks from hybridisation and predator control, and positive support from the local community. The project was granted a translocation licence in January 2023, and the first (soft) releases took place in Summer 2023. Extensive post-release monitoring, including GPS collaring of released wildcats, is providing vital information for targeting ongoing threat mitigation, including Trap-Neuter-Vaccinate-Return of feral cats and engagement with gamekeepers, as well as key behavioural data to inform subsequent releases.

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Factors associated with rehabilitation success in wild black cockatoos (Calyptorhynchus spp.) released in south-west Western Australia

Dr Anna Le Souef[1], Professor Kristin Warren[1], Dr Mieghan Bruce[1], Dr Bertrand Ng[2], Dr Rebecca Vaughan-Higgins[1], Dr Jill Shephard[1]
[1]Murdoch University, Murdoch, Australia, [2]Australia Zoo, Beerwah, Australia

Biography:
Anna is currently a Program Officer at Murdoch University on the Carnaby's cockatoo conservation project 'Keep Carnaby's Flying- Ngoolarks Forever' and has studied health in wild black cockatoos in south-west Western Australia for over 15 years. Anna also works as a veterinarian at Perth Zoo.

Three species of endemic wild black cockatoos (Carnaby's cockatoos (Calyptorhynchus latirostris), Baudin's cockatoos (C. baudinii) and forest red-tailed black cockatoos (C. banksii naso)) are treated and rehabilitated for release through a program at the Perth Zoo Veterinary Department and Kaarakin Black Cockatoo Conservation Centre. The majority of admitted cockatoos have been injured by vehicle strike, but other presentations include raven attack injuries, gunshot injuries and a paralysis syndrome. Measuring the success of this program is important for enhancing veterinary treatment and rehabilitation practices, as well as optimising resource allocation and animal welfare. According to the IUCN/SSC guidelines, rehabilitation is not included in the definition of conservation translocation, but we would consider this study to be of significance due to the numbers of otherwise healthy individuals that are returned to populations and have been found to re-flock and become reproductively active. In this study, post-release success was defined as flock integration one month following release and was assessed using tracking data collected using satellite and GPS telemetry combined with on-ground observations. Thirty-four variables were analysed for their effect on rehabilitation success in 119 black cockatoos, including injury type and time spent in captivity and with conspecific groups prior to release. The findings of this study are important for the ongoing refinement of the program which in turn significantly contributes to conservation efforts for these species.

Genetic management of the Asian houbara translocation program and its benefits for the preservation of the species migratory routes

Dr Loic Lesobre[1], Dr Yves Hingrat[1], Dr Frédéric Lacroix[1]

[1]Reneco Wildlife International Consultants, Abu Dhabi, United Arab Emirates

Biography:
Loic Lesobre is a experienced geneticist with over 25 years research experience in conservation genetics, working with various organisms and across various projects such as the population genetics studies of endangered species and genetic management of conservation programs including both in- and ex-situ populations.

The Asian houbara (Chlamydotis macqueenii) is registered as vulnerable in IUCN's Red list and inhabits steppes from the Middle East to Central Asian, with Northern breeding populations wintering in the South and Southern populations being round-year resident. As part of a translocation program, combining both in- and ex-situ measures, three main migration corridors were identified, along with evidence for a severe decrease in the number of long-distance migrants wintering in the Gulf. These results were combined with population genetics studies leading to the identification of conservation units within the species. A strict genetic management strategy was then implemented to oversee captive populations and account for these conservation units while preserving the initial genetic diversity of the species in captivity. This management strategy permitted the maintenance of more than 95% of the initial genetic diversity, while allowing for the production and release of several thousand captive-bred houbara into the wild over a period of 10 years. Above 1200 of these individuals were equipped with satellite transmitters and their migration patterns not only confirmed that captive-bred houbara were able to migrate similarly to their wild counterparts, but also that the long-migrant phenotype was preserved, with captive-bred houbara wintering in the Gulf. These results confirmed that a strict genetic management strategy was successful in maintaining appropriate migratory behaviour in captivity therefore providing individuals to support in-situ conservation measures.

Exploring potential methods to increase amphibian survival after reintroduction by understanding disease resistance and making spicy frogs spicier

Dr Luke Linhoff[1], Dr. Brian Gratwicke[1], Dr Roberto Ibañez[2]
[1]Smithsonian's National Zoo and Conservation Biology Institute, Washington DC, United States,
[2]Smithsonian's Tropical Research Institute, Panama City, Panama

Biography:
Post-doctoral Research Fellow at the Smithsonian's National Zoo. 15 years of experience working with amphibian conservation translocations. Lead author of the IUCN Guidelines for Amphibian Reintroductions and Other Conservation Translocations (2021). National Geographic Explorer.

The Panama Amphibian Rescue and Conservation (PARC) Project is one of the largest amphibian conservation and captive assurance colonies in the world. The program has established in 2009. It maintains captive populations of twelve highly threatened amphibian species, and it has performed several reintroduction trials in Panama. Many of these species declined catastrophically due to the amphibian chytrid fungus. In this talk, we will provide a brief overview of the program, major milestones, and then highlight two recent research projects. The first project works to understand how much variation in susceptibility to the amphibian chytrid fungus exists within the captive collection, both between species and individuals of different captive-bred genetic lines. Experimental live-pathogen exposure trials were paired with a non-invasive assay of skin mucosome effectiveness to inhibit the chytrid fungus and subsequently correlated for predicted to observed disease susceptibility of animals in the collection. By

comparing mucosome effectiveness within known pedigrees and sibling groups of captive-bred animals, we can explore the potential for artificial selection for disease and better understand how our species may fare in the wild after reintroduction. The second research project that will be discussed has supplemented two rare frog species with an artificially synthesized alkaloidal toxin (decahydroquinoline) that captive-bred animals lose in captivity. Without these antipredator toxins, some frogs likely experience higher rates of predation once reintroduced. Our results may provide important tools for improving the success rates of future reintroductions.

Translocations in the context of a long-term strategic recovery plan for the pine marten (Martes martes) in Britain

Dr Jenny MacPherson[1], Dr Patrick Wright[1]
[1]Vincent Wildlife Trust, Ledbury, United Kingdom

Biography:
Jenny was based at Royal Holloway University of London for 10 years, carrying out research on the ecology and behaviour of a range of mammal species. Jenny has been involved with species reintroduction programmes in the UK and elsewhere since 1997

In Britain, there is currently an increasing interest in reintroducing pine martens (Martes martes), but proposed projects are often locally planned and motivated without knowledge of other, similar projects or consideration of how they fit within the wider context of pine marten conservation. A national, strategic approach was needed to help guide decision makers. The recovering population of pine martens in Scotland is currently the most suitable source of animals for translocations elsewhere in mainland Britain. However, it is important to protect the recovering pine marten population in Scotland, as well as to facilitate natural recolonisation where possible. Therefore, reintroductions should only be done in a way that minimises risk to donor populations and maximises the probability of reintroduced populations establishing, spreading and ultimately linking up. We developed a simple and transparent framework based on a combination of widely used modelling methods that can be used to inform decisions around spatial targeting of pine marten conservation measures. We used habitat suitability modelling in combination with Circuitscape, to model connectivity across the landscape. We then carried out spatially explicit Population Viability Analyses (PVA) to link landscape structure from the habitat model with habitat quality and population dynamics. We ran a series of simulations to look at likely patterns of pine marten persistence, dispersal and range expansion both at a national scale with and without translocations, and, at a finer scale, to further investigate potential reintroduction regions.

Assisting the migration of dispersal limited rainforest species to predicted climate refugia

Mr Justin Mallee[1]
[1]NPWS NSW, Byron Bay, Australia

Biography:
Justin Mallee is a Threatened Species Officer for National Parks and Wildlife Service, based in northeast NSW. Justin currently manages a number of narrow range endemic flora species including rainforest trees, montane shrubs and cliff herbs. Justin has a background in ecological restoration, private land conservation and threatened flora translocations.

Previous climate change events have resulted in global mass extinctions. Modelling of climate impacts to the Gondwanan Rainforest of the Tweed Caldera in northeast NSW have predicted reductions in species abundance and contraction in suitable habitat. One method to mitigate these impacts is assisted migration, a tool widely discussed in conservation ecology since the early 2000's.

National Parks and Wildlife Service of NSW are partnering with numerous organisations and experts to develop and implement conservation strategies to improve in-situ genetic diversity and assist the migration of dispersal limited rainforest species, to predicted climate refugia. Species with current and planned actions include Elaeocarpus sedentarius (Minyon Quandong), Eidothea hardeniana (Nightcap Oak), Diploglottis campbellii (Small-leaved Tamarind) and Endiandra floydii (Crystal Creek Walnut). The aim of these translocations is to both increase the adaptive capacity of existing populations and to establish genetically diverse, self-sustaining populations for the most at-risk species. The new populations will be representative of wild sites and provide insurance against predicted losses associated with climate impacts.

Intensive monitoring essential for identifying factors influencing reintroduction success: a case study using the red-tailed phascogale

Ms Tessa Manning[1], Ms Catherine Lynch[2], Dr John Read[1,3], Associate Professor Katherine Moseby[3,4]
[1]University of Adelaide, Adelaide, Australia, [2]Arid Ecological Services, Port Augusta, Australia, [3]Ecological Horizons, Kimba, Australia, [4]University of New South Wales, Sydney, Australia

Biography:
Tessa Manning is a PhD student at the University of Adelaide. She is investigating the behaviour, diet, and reproduction of reintroduced red-tailed phascogale populations. She has a passion for dasyurids, arid zone ecology, reintroduction ecology, and conservation genetics.

Red-tailed phascogales (Phascogale calura), a small, arboreal, nocturnal carnivorous marsupial, have been the subject of eight reintroduction attempts in the past seventeen years. Three of these reintroduction attempts have released juvenile animals without radio-collaring, and success is uncertain. In November 2022 twenty captive-bred juvenile phascogales were released into a feral-predator-free reserve: Mallee Refuge in South Australia. Our study was the first radio-tracking study of juvenile red-tailed phascogales and we uncovered important considerations for future releases. We radio-tracked nineteen individuals and placed remote cameras at nest boxes. We found that the juvenile phascogales were losing weight, and that males were prone to hyperdispersal. Our experience demonstrates that reintroductions to safehavens and lack of predation pressure are no guarantee of success. We posit that weight loss was caused by colder-than-average temperatures at the time of release with individuals entering torpor instead of actively foraging. Male phascogales are known to disperse widely; it is difficult to mitigate this behaviour. In response to weight loss we implemented a supplementary feeding regime. Dispersing males were tracked, trapped, and returned to the release site to retain them in the new population. With lessons learned, we will release eleven captive-bred adult phascogales in May 2023, implementing intensive monitoring and supplementary feeding immediately post-release. We will release mothers carrying pouch young in July 2023 in a soft-release scenario. We will present results of the juvenile release, as well as from our two planned adult releases, with a focus on using intensive monitoring to determine individual fate and success.

Translocation efforts for the critically endangered Northern Corroboree Frog (Pseudophryne pengilleyi) in south-eastern Australia

Mr Michael McFadden[1,2], Dr David Hunter[3], Dr Monique Van Sluys[1], Assoicate Professor Philip Byrne[2]
[1]Taronga Conservation Society Australia, Mosman, Australia, [2]University of Wollongong, Wollongong, Australia, [3]NSW Department of Planning and Environment, Albury, Australia

Biography:
Michael is the supervisor of the Herpetofauna Department at Taronga Zoo. His main focus is reintroduction biology and improving the output of conservation breeding programs. He currently oversees conservation breeding programs for seven critically endangered reptile and amphibian species.

The Northern Corroboree Frog (Pseudophryne pengilleyi) is a small myobatrachid frog restricted to the Brindabella and Fiery Ranges of south-eastern Australia. It has rapidly declined in recent decades largely due to disease, caused by infection with amphibian chytrid fungus (Batrachochytrium dendrobatidis). Population numbers are critically low, with two of the three Evolutionary Significant Units (ESU) within the species consisting of less than 200 mature adults. Immediate management objectives for this species include establishing robust insurance colonies, maintaining populations in the wild via translocation, and developing efficient offspring production and translocation methods.

Conservation breeding programs for the two smaller Brindabella Range ESUs were established close to twenty years ago with trial translocation programs underway for approximately ten years. An insurance population for the larger Fiery Range ESU has been established at Taronga Zoo since 2020 as an emergency response to the impact of the devastating 2019/20 bushfires on its remaining breeding populations. Translocations for this species have focused on maintaining viable populations of the species despite the ongoing presence of chytrid fungus. Experimental translocations currently include the release of eggs and frogs into artificial and natural pools at wild sites, investigating factors such as the effect of seasonal timing and the age of released frogs on post-release survival and reproductive success. Additionally, research is being undertaken on artificial reproductive technologies to increase the output of offspring for release and husbandry techniques to maximise the health of offspring being translocated.

Yes we can! Reinforcement of a diseased population of Tasmanian devils

Dr Elspeth McLennan[1], Dr Yuanyuan Cheng[1], Dr Katherine A. Farquharson[1,5], Associate Professor Catherine Grueber[1], Ms Jodie Elmer[2], Ms Lauren Alexander[1], Dr Samantha Fox[2,3], Prof Katherine Belov[1], Professor Carolyn Hogg[1,4]
[1]The University of Sydney, Sydney, Australia, [2]Department of Natural Resources and Environment, Hobart, Australia, [3]Toledo Zoo and Aquarium, Toledo, USA, [4]San Diego Zoo and Wildlife Alliance, San Diego, USA, [5]ARC Centre of Excellence for Innovations in Peptide and Protein Science, The University of Sydney, Sydney, Australia

Biography:
Dr Elspeth McLennan is a postdoctoral research associate in the Australasian Wildlife Genomics Group at The University of Sydney. Elspeth's research focuses on translocations as a conservation tool and the integration of genetic information to inform management decisions.

Translocations are a well-established tool to combat biodiversity loss yet still face a great deal of scrutiny. Two arguments against translocations are that genetic augmentation will swamp out

local genetic variants and increasing population density will increase threatening processes, particularly disease. There is currently little evidence to support either of these arguments, but they are continually used to push back against translocation proposals. Arguably, doing nothing has far greater consequences as isolated populations continue to decrease and succumb to the genetic pressures of small population size. Here we use the release of 33 Tasmanian devils to an isolated, diseased population of less than 20 animals to investigate genetic diversity changes and prevalence of devil facial tumour disease between 2016 and 2021. Released animals successfully bred with incumbent individuals, tripled population size, improved genome-wide diversity and introduced 26 new functional genetic variants to the population and with no common genetic variants lost. We identified 12 genotypes that were associated with improved immunogenetic fitness, all of which were either introduced, increased, or maintained during the reinforcement. Disease prevalence remained consistent throughout the project. Combined, our results show that over eight years of monitoring, approximately three devil generations, there was no evidence for swamping out local genetic variants or increasing the prevalence of DFTD. Instead, we improved demographic structure, genetic diversity, and adaptive potential of a critically small population. Here we show carefully planned translocations can be used for populations facing strong selective pressures and infectious diseases.

A combination approach: Maximum entropy modelling and fieldwork to assess the suitability of historical habitat for the endangered pygmy bluetongue

Ms Kimberley Michael[1], Dr Ryan Baring[1], Professor Mike Gardner[1,2]
[1]Flinders University, Adelaide, Australia, [2]South Australian Museum, Adelaide, Australia

Biography:
Kim is a PhD Candidate researching the ecology of the endangered pygmy bluetongue at different habitat scales to inform future translocations.

Anthropogenic actions have caused irreversible damage to biodiversity and led to the current conservation crisis, the sixth mass extinction. For some species, such as the endangered pygmy bluetongue (Tiliqua adelaidensis), translocation into their historical range of Adelaide, South Australia is anticipated to mitigate against the threat of extinction. Understanding species' interactions at different habitat scales will improve translocation success, as fauna may show a pattern of habitat use if they rely on a specific habitat component. Pygmy bluetongues rely on spider burrows (microhabitat) in grasslands (site) with some form of grazing (landscape). We aimed to assess the viability of translocating the pygmy bluetongue into its historical range of Adelaide. We used maximum entropy modelling to model future habitat suitability in Adelaide using the pygmy bluetongue, and two indicator species, brush wire grass (Aristida behriana) and the Adelaide trapdoor spider (Blakistonia aurea). We found brush wire grass was the best indicator species and identified four potential translocation sites within the Adelaide region. We compared these four potential translocation sites to four pygmy bluetongue populations at the southern, central, and northern ranges of the lizard's current distribution for habitat assessments of known versus potential pygmy bluetongue habitat. We will discuss the results of using different indicator species during maximum entropy modelling and focus on the site level assessments, presenting insights into the inter-tussock space preferences of the lizards, invertebrate capture trials, soil structure analyses, spider burrow surveys, and their implications for future translocations of pygmy bluetongues into Adelaide.

From Scats to Stats: The Development and Applications of Scat Genetic Monitoring

Melissa Millar[1], **Mrs Shelley McArthur**[1], **Dr Diana Prada**[1], **Dr Kym Ottewell**[1]
[1]Department of Biodiversity, Conservation and Attractions, Kensington, Australia

Biography:
Rujiporn Thavornkanlapachai is a research scientist at the Department of Biodiversity, Conservation and Attractions. She is experienced in developing 'molecular tagging' protocols for individual identification from faecal samples. Her previous research is on the genetic consequences of population mixing in mammal translocations (dibblers, boodies, and mountain pygmy possums).

DNA obtained from non- or minimally invasive samples such as scats, hairs, feathers, and shells can be used to monitor individuals in conservation settings, an approach known as 'molecular tagging'. Non-invasive sampling is favoured over live capture due to the ability to monitor elusive species, as well as minimise human disturbance and eliminate risk of injury or death during live capture. Here we demonstrate the development and applications of 'molecular tagging' using scats from one bat and three mammal species (ghost bat, banded hare wallaby, rufous hare wallaby, and bilby). First, we pre-select potential Single Nucleotide Polymorphism (SNP) markers from population genomic data to generate a panel of ~50 SNPs markers for individual identification. Second, DNA is extracted from scats using protocols that handle poor quantity/quality scat DNA. Extracted DNA is then genotyped with the pre-selected SNP panels on the MassArray platform. We can also assign sex to scats using custom-made sexing markers. Lastly, the data generated is processed in our custom-made publicly available R package 'ScatMatch' by filtering scat genotypes' quality, assigning scats to individuals and incorporating other metadata such as GPS locations and sex into the final report. Genetic tagging can reveal spatial and temporal patterns of habitat usage, track hybridization patterns, assess the success of translocations or predator control and can be incorporated into models to estimate abundance (mark recapture) and distribution (species distribution model). Molecular tagging provides a bridge between genetics and ecology and represents a valuable tool in the species monitoring toolkit.

Genetic rescue of the Helmeted Honeyeater: incorporating empirical kinships of founders to improve metapopulation management

Dr Kimberly Miller[1], Ms Karina Cartwright[1], Ms Monique Winterhoff[1]
[1]Healesville Sanctuary, Healesville, Australia

Biography:
Dr Kim Miller oversees breeding and research programs for 12 threatened species at Healesville Sanctuary, with a research focus in conservation genetics and reintroduction biology. Kim is a member of several recovery teams, and the Translocation Evaluation Panel, who assess all applications for translocations of threatened fauna in Victoria, Australia.

Many conservation breeding programs commence without incorporating empirical data on founder relatedness, which can accelerate losses of genetic diversity and inbreeding. Here we summarise how we incorporate empirical founder relationships into the genetic and demographic management of a genetic rescue program across a wild and captive metapopulation. A captive breeding program for the critically endangered Helmeted Honeyeater (Lichenostomus melanops cassidix) has been running since 1989, resulting in the release of more than 350 birds to the wild. The single remnant population of Helmeted Honeyeaters was as small as 50 birds, and remains under 200 birds. Inbreeding depression is evident within the wild

population, and birds do not avoid inbreeding. A program of genetic rescue has been underway since 2017, where Helmeted Honeyeaters are bred in captivity with a related subspecies, and the offspring are released. This program is unique in having a near-complete pedigree for the entire metapopulation, which enables detailed monitoring of the progress of genetic rescue. Founder relatedness of all Helmeted Honeyeaters and Yellow-tufted Honeyeaters across the metapopulation is incorporated into a studbook. Pairing decisions for captive birds are made to produce the lowest mean kinship birds in the metapopulation, so that annual translocations reduce the inbreeding burden in the wild. The average inbreeding coefficient of wild birds can be analysed annually to track progress against the goals for genetic rescue. This approach enables more effective decision-making, improves the productivity of the captive population, and supports the genetic rescue of the wild population.

Warru Ngurakutu Kulpanyi: Bringing Back Warru (black-footed rock-wallaby) to the Everard Ranges, South Australia

Mr Oska Mills[1], **Mr Arnold Dodd**[1], Mr Peter Hamnett[1]
[1]Anangu Pitjantjatjara Yankunytjatjara, Umuwa, Australia

Biography:
Oska is the coordinator for the Warru Kanyintjaku project in the Anangu Pitjantjatjara Yankunytjatjara Lands in north west South Australia. The project manages several remnant and reintroduced warru populations in the APY Lands. Arnold is an Anangu man and senior ranger working in the Antara Sandy Bore Indigenous Protected Area.

Translocation is a useful tool for the conservation and ecological research of threatened species, but in remote First Nations communities translocation projects can enhance connection to country, perpetuate traditional ecological knowledge, create employment, and promote self-determination. To optimise social and cultural outcomes, First Nations participation must be central to project design, decision-making, and delivery.

In August 2022, Anangu traditional owners and conservation practitioners applied co-design principles to translocate 40 warru/Black-footed rock-wallaby (Petrogale lateralis centralis) to the Everard Ranges in remote north-west South Australia, a location where warru disappeared approximately 60 years ago.

While suitable habitat is abundant, the region's complex cultural landscape necessitated community-led decision-making to select inclusive, culturally safe, and ecologically appropriate release sites. For its ongoing management, the project has adopted a two-way science approach for both strategic decision-making and day-to-day management through the formation of an Anangu steering committee and Anangu ranger teams, providing a strong example of First Nations co-design in conservation.

A census of the founder population will occur after 12 months, though monitoring indicates recruitment and mortality rates comparable to other monitored populations in the APY Lands. Regular monitoring led by Anangu rangers has fostered project ownership and provided additional ecological benefits including fine-scale knowledge of threatened plant and pest species distributions, and optimum foraging and den site conditions for warru. The project has promoted a strong sense of local pride and enthusiasm, catalysing increased workforce participation and ranger recruitment, increased household incomes and broader conversations within the community around caring for country.

Preparing for translocation: understanding hatching success in the Guam kingfisher (Todiramphus cinnamominus), an extinct-in-the-wild bird

Mr Matthew Mitchell[1,2], Dr Ryan Felice[2], Dr Amanda Trask[1], Dr. John Ewen[1]
[1]Institute of Zoology, Zoological Society of London, London, United Kingdom, [2]Centre for Integrative Anatomy, Department of Cell and Developmental Biology, University College London, London, United Kingdom

Biography:
I am a PhD student at UCL and the Institute of Zoology studying the effects of long-term captivity on the phenotype of extinct-in-the-wild birds. I aim to understand how phenotypic change over time in captivity might influence the success of conservation translations back into the wild.

When planning conservation translocations of species from ex-situ environments to the wild, it is essential to ensure that captive populations can act as reservoirs for bolstering or replacing wild populations without damaging their own viability. However, many ex-situ populations of highly threatened species suffer from low reproductive success, with low genetic diversity hypothesised to be a critical constraint on pre-zygotic and pre-hatching survival rates, and thus on population growth. Here, we interrogate the factors that influence these rates in the sihek (Guam kingfisher, Todiramphus cinnamominus), an extinct-in-the-wild species that has conservation translocations to the wild planned imminently. The sihek population suffers from high inbreeding load, with dam inbreeding coefficient negatively correlated with reproductive success. Population trajectories indicate that specific management strategies are required to ensure the sihek population's persistence, presenting a need to understand which aspects of the reproductive process influence low success. We find extremely low hatching success (20%) and egg development rates (47%) in the sihek population, compared to other threatened bird species. Using Bayesian generalised linear mixed models, we investigate the effect of parental factors (e.g., inbreeding, age) and incubation strategy on both rates in the sihek using records of 539 eggs laid in captivity over the past 35 years. Our models demonstrate that parental effects and incubation type do not influence egg development or hatching success rate. Therefore, we predict that growing the sihek population for the purpose of harvesting individuals for translocation will not be hindered by high levels of inbreeding at pre-hatching development stages.

15 years in: lessons being learned from assisted colonisation trials of Australia's most threatened turtle

Prof Nicola Mitchell[1], Ms Bethany Nordstrom[1], Ms Siobhan Paget[1], Mr Nick Rodriguez[1,2], Ms Nikita Binetti[1], Dr Gerald Kuchling[1,2]
[1]School of Biological Sciences, The University of Western Australia, Crawley, Australia, [2]Department of Biodiversity, Conservation and Attractions, Parks and Wildlife Service, Wanneroo, Australia

Biography:
Nicki Mitchell is physiological ecologist focused on anticipating and mitigating the impacts of climate change on threatened animals. She leads an active research group, many of whom study conservation translocations. Nicki provides sceintific advice to the Australian Government, and is a lead councillor for Australia's Biodiversity Council.

Assisted colonisation – the introduction of a species outside its indigenous range for conservation purposes – has been suggested for several decades as a pragmatic response to climate change. But virtually no one has tried it. In this presentation I describe a collaboration

between researchers and managers where assisted colonisation is being trialled to reduce the risk of extinction of a Critically Endangered freshwater turtle. The western swamp turtle is a long-lived reptile native to Perth and occupies seasonal wetlands on which it depends for food and reproduction. Much of its former habitat has been cleared, and the small fragments that remain are slowly drying due to declining rainfall and groundwater. Conservation translocations of juveniles raised in captivity have generally been successful, with more than 1000 individuals now released, but the long-term climatic suitability of translocation sites is a key concern. Consequently, based on biophysical modelling, multiple criteria analysis and empirical data, we have shifted our focus to evaluating release sites in cooler and wetter parts of south-west Australia. Beginning in 2016, juvenile turtles have been released into novel wetlands across a 350 km latitudinal gradient to study their growth, physiological performance, and survival. Now into our fourth trial, we have used each translocation experiment to answer increasingly complex questions, and to focus on the most promising wetlands for assisted colonisation south of the species known range. Our evidence-based approach is potentially a much-needed global example to break the apparent inertia between policy making and implementation of assisted colonisation initiatives.

Genetic and mating system assessments of translocated populations of threatened flora

Ms Leonie Monks[1,4], Ms Rebecca Dillon[1,3,4], Dr David Coates[1,2], Prof Michelle Waycott[3], Mrs Shelley McArthur[1], A/Prof Rachel Standish[4]
[1]Department of Biodiversity, Conservation and Attractions, Kensington, Australia, [2]School of Biology, University of Western Australia, Perth, Australia, [3]School of Biological Sciences, The University of Adelaide, Adelaide, Australia, [4]Environmental and Conservation Sciences, Murdoch University, Murdoch, Australia

Biography:
Leonie Monks is a Research Scientist with the Western Australian Department of Biodiversity, Conservation and Attractions. Her research is focused on exploring techniques to improve the successful establishment of plant translocations and investigating ways to understand and measure plant translocation success.

Translocations are used to enhance plant numbers in small and declining populations, reintroduce plants to sites where the species previously occurred or to establish populations in new safe sites. In each case the goal is to establish self-sustaining populations with adequate genetic variation to adapt and evolve as necessary. While the amount of genetic diversity in founding plants will be important, factors that influence the maintenance of genetic diversity, such as the mating systems, will also play a major role in population persistence and resilience. This talk will describe the outcomes of recent studies of genetic diversity and mating systems of four threatened plant species in Western Australia with translocated populations. These studies demonstrated that the strategy for establishing the new populations (single source population or admixture of multiple source populations) played a significant role in determining the levels of genetic diversity found, with admixture supporting an increase in genetic diversity relative to populations founded from a single large healthy source population. However, for two species levels of genetic diversity captured in the founding plants were unlikely to be maintained in subsequent generations due to patterns of pollination that resulted in high levels of inbreeding. The results from these studies are being used to inform future management of these translocated populations and guide seed sourcing strategies for establishing new populations.

Traditional Owners as partners in reintroduction projects: translocating golden bandicoots from Western Australia to New South Wales, Australia

Dr Dorian Moro[1], **Dr Rebecca West**[2], Dr Reece Pedler[2], Dr Cheryl Lohr[3], **Valdera Morgan**[1], **Ruth Wongawol**[1]
[1]Tarlka Matuwa Piarku Aboriginal Organisation, Perth, Australia, [2]University of New South Wales, Australia, [3]Department of Biodiversity, Conservation and Attractions, Perth, Australia

Biography:
Dorian works as the Manager for a self-regulating Indigenous Ranger Company. His role is to empower the Wiluna Martu Rangers and western scientists to learn from each other. Rebecca works as the ecologist for Wild Deserts whose role is to reintroduce native animals to Sturt National Park in outback NSW.

Conservation activities on Indigenous lands are becoming an emerging theme across Australia with the support of Traditional Owners (TOs). The integration of Indigenous rangers as part of a broader team of land managers means that many conservation programs can now extend beyond the boundary of the formal conservation estate. Indigenous custodians are more likely to connect to conservation initiatives and to support these from the very start. Here, we describe a recent example where TOs were engaged early in a conservation translocation proposal in 2021 to reintroduce golden bandicoot marsupials (Isoodon auratus) from the Matuwa Indigenous Protected Area in central Western Australia to the Sturt National Park of western NSW where they had been locally extinct for over 100 years. TO engagement on Country at both source and release sites, including field work involving animal capture and data recording, led to the successful transport and release of 27 golden bandicoots across remote deserts separated by some 3,000 km. Planning required considered consultation between western managers, scientists and TOs across organisations, as well as Indigenous acknowledgement for those visiting different Country. This cross-cultural respect led to important conservation benefits for the species, and created an important opportunity for the Martu of the western desert and the Wongkumara of the Maljangapa of western NSW to connect with animal conservation, and to benefit from employment within the reintroduction context.

Post release hyperdispersal: an underacknowledged contributor to translocation failure

Associate Professor Katherine Moseby[1]
[1]UNSW Sydney, Wild Deserts, Sturt National Park, Australia

Hyperdispersal is the long-distance movement of individuals after release, also referred to as homing behaviour, panic dispersal, failure to settle and extreme post release movement. Hyperdispersal appears to be common in a range of taxa but is rarely acknowledged as a major factor in translocation failure. We review reported incidences of hyperdispersal in the global literature and compare rates of hyperdispersal among taxa, population demographics, release cohorts, and the success of mitigation techniques. From 151 conservation translocations where animal movements were detailed, we confirmed hyperdispersal in 52.1% of programs. We found numerous definitions used to describe significant post release movement of individuals, with most describing situations where an individual moves away from the translocation site such that it becomes isolated from the rest of the release cohort and is unlikely to contribute to population establishment.

The prevalence of hyperdispersal (percentage of studies) was relatively consistent across taxa (42.9–60%) suggesting that the issue is common and widespread. The prevalence of hyperdispersal is likely significantly underestimated as collar failure is commonly blamed when animals are unable to be located after release. For example, 77% of bird translocations reported incidences where birds could not be located after release but only 44% of bird studies reported hyperdispersal. The incidence (percentage of individuals in a cohort) of hyperdispersal was higher in eutherian mammals (20.2%) than birds, reptiles and marsupials (10.4%, 15.7%, and 10.3%, respectively). However, incidence was highly variable between species even within taxa with some recording hyperdispersal rates of 100%. No significant trends were observed for sex, source population or translocation type, but there were non-significant trends for sex and presence of conspecifics. A range of mitigation techniques were used by practitioners to try and reduce hyperdispersal including temporary confinement, supplementation of resources, and releasing animals in social groups. We outlined the success of each method and found only half of studies testing mitigation techniques found them useful. We suggest that hyperdispersal is an underacknowledged but significant welfare, economic, and conservation issue in translocations and requires specific experimental strategies to understand and address it.

Navigating a path to recovery for kiwikiu: a Hawaiian finch in peril

Dr Hanna Mounce[1], Ms Laura Berthold[1], Mr Christopher Warren[2], Hillary Foster[1], Dr Lainie Berry[3]
[1]PCSU - UH - Maui Forest Bird Recovery Project, Makawao, United States, [2]Haleakalā National Park, Kula, United States, [3]State of Hawaii Department of Land and Natural Resources, Division of Forestry and Wildlife, Honolulu, United States

Biography:
Manager for the Maui Forest Bird Recovery Project, Pacific Cooperative Studies Unit, University of Hawai'i, Mānoa. Dr. Mounce has been working with Hawaiian honeycreepers since 2006. She coordinates the recovery actions for kiwikiu and alala, as well as manages the implementation of landscape level mosquito control on Maui.

Kiwikiu (Pseudonestor xanthophrys) is an endangered Hawaiian finch endemic to the island of Maui within the United States. Due to its small range and population, the U.S. Fish & Wildlife Service recommended establishing a second population of kiwikiu within its historical range. In 2019, we attempted to reintroduce the kiwikiu to the south slope of East Maui in an area where they were once found. After a decade of preparation, including fencing, ungulate removal, outplanting, avian disease surveys, predator trapping, and mosquito control, the area was presumed ready. Fourteen kiwikiu were transferred to the site: seven wild and seven from a conservation breeding facility. They were placed into aviaries within the translocation site for 1-2 weeks. Before release, a transmitter was placed on the bird to allow for tracking. After only a month, all but three were confirmed to have died from avian malaria, a non-native disease spread by invasive mosquitoes that had expanded into higher elevations. The translocation highlighted the variance in mosquito movements and how quickly disease can flood a habitat. This awakened the possibility that kiwikiu may have few years left before extinction, persisting within a narrow band of elevation on the north slope of East Maui. Their recovery is now dependent on landscape-level disease control, a tool under development. We will continue to monitor the wild population, encourage habitat restoration, establish a population in captive care, and evaluate the possibility of a translocation to another island, while implementing urgently needed disease control.

Principles of translocation approvals in Australia

Mr Simon Nally[1]

[1]Department of Climate Change, Energy, Environment and Water, Canberra, Australia

Biography:
Simon is an ecologist experienced in ecological restoration and the translocation of threatened species. Simon has worked closely with local communities including Indigenous Rangers to develop conservation plans for threatened species such as the Greater Bilby, Mala, Malleefowl, and Night Parrot.

The translocation of threatened species is usually a regulated activity that may be subject to one or more authorisation processes. Anticipating the types and nature of authorisations that may be required reduces the risk that a translocation is delayed, changed, or denied as a result of unforeseen authorisation processes. Once you know what authorisations are required, the duration of the process and the end outcome is dependent on your understanding of the purpose of the authorisation and the relevance of the information you provide.

Common to many authorisations are key principles that relate to; promoting the conservation of the species, retaining genetic diversity, consistency with conservation plans, the advice provided by governance bodies, policies and guidelines, the control or ownership of animals and genetic diversity, and the management of risk.

Early dialogue with the approval authority fosters a common understanding of the proposal, the purpose of the authorisation, the nature of the application information required, and the process time that should be expected.

Fostering dialogue between different approval authorities based on the key principles can both streamline authorisation processes and establish confidence in the rigour of your proposal in managing risk.

Understanding the trophic interactions and impacts of reintroduced mammals using scatDNA

Dr Linda Neaves[1], Samantha Shippley[1], Jenny Newport[1], Mx Belinda Wilson[1], Dr Teresa Neeman[1], Dr Iain Gordon[1,2,3,4,5], Prof Adrian D. Manning[1]
[1]Australian National University, Canberra, Australia, [2]The James Hutton Institute, Dundee, UK, [3]Central Queensland University, Townsville, Australia, [4]Land & water, CSIRO, Townsville, Australia, [5]Protected Places Mission, National Environmental Science Program, Reef and Rainforest Research Centre, Cairns, Australia

Biography:
My research uses genomic tools to address a range of species management and conservation based problems for plants and animals, including species detection, population genetic diversity and structure and species interactions and diets. I am particularly interested in translocated populations, and have developed general policy and guidance for undertaking translocations.

Reintroduction is a key conservation tool, particularly in Australia where predation by introduced feral cats (Felis catus) and red fox (Vulpes vulpes) have extirpated many species from much of their distributions. While establishment of populations is often the focus, the trophic interactions and impacts of reintroduced species on existing species requires attention if conservation actions are to be effective in the long term. The Mulligans Flat Woodland Sanctuary (MFWS) in the Australian Capital Territory, Australia has facilitated the reintroduction and establishment of a range of mammals, including the eastern quoll (Dasyurus viverrinus) and eastern bettong (Bettongia gaimardi) to threatened

Box-gum grassy-woodland habitat. We used next-generation sequencing of faecal samples to assess the diet of these two species to understand how they interact with, and potentially impact on the ecosystem. This approach identified unexpected trophic interactions and diet preferences in these two species. Eastern quolls consumed a larger than expected variety of vertebrate prey, while the eastern bettongs were shown to be consuming a range of geophytic and tuberous plant species, but only at certain times of year. Understanding the diet of reintroduced populations, particularly where species are contained within fenced sanctuaries, is critical to the long-term success of conservation translocations. The application of genomic tools, combined with ecological data at MFWS is providing information critical to our understanding of these reintroduced species and their trophic interactions that can enhance ongoing management.

Assisted Colonisation of the Critically Endangered Western Swamp Turtle: Insights from Non-Invasive eDNA Approaches

Ms Bethany Nordstrom[1], Ms Caitlin Cornish[1], Dr Alyssa Budd[2], Prof Nicola Mitchell[1], Dr Margaret Byrne[1,3], Dr Gerald Kuchling[3], Prof Simon Jarman[4]
[1]School of Biological Sciences, The University of Western Australia, Crawley, Australia, [2]Environomics Future Science Platform, Indian Ocean Marine Research Centre, Commonwealth Scientific and Industrial Research Organisation (CSIRO), Crawley, Australia, [3]Biodiversity and Conservation Science, Department of Biodiversity, Conservation and Attractions (DBCA), Australia, [4]School of Molecular and Life Sciences, Curtin University, Bentley, Australia

Biography:
Bethany Nordstrom is a PhD Candidate at the University of Western Australia studying the impacts of climate change on the Critically Endangered Western Swamp Turtle (Pseudemydura umbrina)

The Critically Endangered western swamp turtle (Pseudemydura umbrina), a long-lived species endemic to southwest Australia, has experienced extensive habitat loss and fragmentation, and its remaining seasonal wetland habitat is threatened by a drying climate. Assisted colonisation trials south of the turtle's indigenous range commenced in 2016 and research is ongoing. When intentionally translocating species, it is essential to evaluate metrics associated with the translocated population (e.g., dispersal, establishment and impacts to the recipient ecosystem). We developed environmental DNA (eDNA) methods to 1) detect P. umbrina, and 2) determine their diet at assisted colonisation sites. Effective monitoring protocols for conservation translocation require techniques that account for the dispersal and cryptic nature of translocated animals, such as non-invasive molecular eDNA approaches. First, we successfully designed, validated, and optimised a sensitive P. umbrina-specific eDNA assay. We detected P. umbrina at the assisted colonisation wetland in 42% (7 / 17) of eDNA sample sites, and the probability of a positive eDNA detection was significantly associated with the distance from P. umbrina, reflecting spatial distribution of the target species. Second, to assess the food web and ecosystem impacts of P. umbrina in a novel environment, we applied DNA metabarcoding to analyse their diet using universal mitochondrial primers targeting their macroinvertebrate and tadpole prey. DNA sequences obtained from faecal samples and cloacal swabs revealed a more precise diet characterisation when compared to the more-invasive method of stomach flushing. As demonstrated here, non-invasive molecular eDNA approaches be effectively implemented to evaluate assisted colonisation performance metrics.

Population viability analysis shows that headstarted green turtles exhibit increased survival to adulthood and the capacity to recover wild populations

Ms Anna Ortega[1,2], Prof Nicola Mitchell[1], Walter Mustin[3], Dr Sean Williamson[4], Dr Philip Miller[5], Dr Vandanaa Baboolal[3], Dr George Shillinger[2]
[1]The University Of Western Australia, Crawley, Australia, [2]Upwell Turtles, Monterey, USA, [3]The Cayman Turtle Centre, West Bay, The Cayman Islands, [4]Monash University, Clayton, Australia, [5]IUCN SSC CPSG, Apple Valley, USA

Biography:
Anna fell in love with science at age six by studying the snapping turtles of Northern Michigan. She is now a PhD Candidate at the University of Western Australia in collaboration with Upwell Turtles, working on the conservation of the critically endangered leatherback sea turtles of the Pacific Ocean.

The global decline of marine turtles has inspired a variety of conservation actions, including headstarting. This short-term captive rearing before wild release targets the highly vulnerable hatchling lifestage and aims to release fitter individuals by maximising early-life growth rates. The impact of headstarting programs has been quantified in freshwater turtles, but not marine turtles due to few long-term, large-scale programs. The Cayman Turtle Centre (CTC) released over 31,000 juvenile green turtles from 1980-2001, and the wild population simultaneously recovered from extirpation. To attribute any credit for wild population recovery to the captive release of headstarted turtles, a process hereafter referred to as supplementation, a population viability analysis is required to compare population trajectories with and without supplementation. This study presents the first quantification of the impact of marine turtle supplementation, by comparing nesting female abundance between simulated scenarios: with and without supplementation. Supplementation of Cayman Island green turtles were shown to have a quantifiable and positive impact on survival to recruitment, with supplemented individuals surviving to recruitment at a rate 3.4 times higher than wild turtles, and a cumulative 145 nesting females added to the wild population. Supplementation has extended the predicted population extinction, from 1848 to 2118; indicating that the CTC releases have recovered the wild population. This work provides the first evidence that headstarted marine turtles can provide a survival advantage that could result in population recovery, and these findings can inform conservation management efforts for other similarly imperilled marine turtle species.

Estimating population density of 'trap-shy' banded hare-wallabies (Lagostrophus fasciatus) using faecal DNA analysis

Dr Kym Ottewell[1], Ms Aline Gibson Vega[1], Melissa Millar[1], Dr Leanne Van Der Weyde[1], Dr Saul Cowen[1]
[1]Department of Biodiversity, Conservation and Attractions, Kensington, Australia

Biography:
Dr Kym Ottewell is a Senior Research Scientist at the Department of Biodiversity, Conservation and Attractions. Her field of expertise is in conservation genetics of threatened fauna, particularly in genetic assessment and monitoring of species in conservation translocations.

Monitoring 'trap-shy' species to assess outcomes of conservation translocations can be challenging where traditional methods of mark-recapture are not feasible. The Vulnerable banded hare-wallaby (Lagostrophus fasciatus) does not readily enter live-capture traps and is rarely observed on camera traps. Further, they do not have unique individual markings making the identification of individual animals difficult. Determining a method to monitor this shy species following their translocation as part of an ecological restoration project to Dirk Hartog Island (DHI), Western Australia, is imperative to assess translocation success.

'Molecular tagging' via genetic analysis of faecal (scat) samples has enabled individual identification of banded hare-wallabies and is a promising tool for species monitoring. In 2019 and 2020, two 300ha survey plots were established on DHI and scats collected along transects within these to estimate census population size. To facilitate high-throughput analysis we developed a custom-designed, species-specific SNP panel for automated genotyping on the MassArray platform. In total, 212 scat samples were genotyped at 48 SNP loci, from which we identified up to 48 individuals across both sampling years using genetic dissimilarity analyses. Population estimates were undertaken using spatially-explicit capture recapture (SECR) analysis based on the number and spatial distribution of individual 'captures'. Whilst an increase in the raw number of individuals was detected between years, density of banded hare-wallabies remained consistent. We demonstrate faecal DNA monitoring as a valuable method of assessing ongoing success of translocations of difficult to monitor species, enabling improved monitoring efficacy in large landscapes and reduced impact on animal welfare.

Quantifying the impacts of introduced predator incursions on reintroduced bird populations in a predator-fenced wildlife sanctuary

Dr Kevin Parker[1], Dr Tim Lovegrove, Mr Matt Maitland, Dr Elizabeth Parlato, Dr Zoe Stone, Professor Doug Armstrong
[1]Parker Conservation Ltd, Nelson, New Zealand

Biography:
Kevin is a conservation scientist with expertise in reintroduction biology, threatened species management, and restoration ecology. He has been directly involved in >70 translocations of 11 bird species and one invertebrate, along with advising on many others in Aotearoa New Zealand, and internationally.

Control of introduced predators is essential for the persistence of many reintroduced species. However, species range in vulnerability from tolerant to completely intolerant, with different tolerances to different predators. Therefore, a prerequisite for efficient conservation management is estimating the tolerances of a range of reintroduced species to introduced predators. We quantified population responses of reintroduced toutouwai (Petroica longipes), popokatea (Mohoua albicilla) and tīeke (Philesturnus rufusater) to increased numbers of two key predators, stoats (Mustela erminea) and cats (Felis catus), at a fenced sanctuary in Aotearoa New Zealand. There were fewer than 0.5 annual detections for these predator species from 2004–2016, but stoat detections increased >10-fold from 2017–2019 and cat detections >30-fold from 2020–2021. We therefore used integrated population models and a dynamic logistic model to estimate the growth and persistence of each bird population pre- and post-2017. We used these models to derive λmax, the finite rate of increase at zero density, which must be >1 for population persistence. The popokatea population showed no sign of having been impacted by the increased predators. The toutouwai population showed tentative decreases in survival and reproduction. Tīeke showed a dramatic reduction in survival and recruitment from 2017–2019 with the population dropping from c. 350 to c. 100. These results show that popokatea are completely tolerant of these stoat and cat levels, but it is unclear whether toutouwai could persist, unclear whether tīeke could persist with the cats, and unlikely they could persist even with small numbers of stoats.

Conservation translocation of a cool temperate rainforest herb, Tall Astelia

Dr Linda Parker[1], Dr Craig Nitschke[1]
[1]The University of Melbourne, Burnley, Australia

Biography:
Linda is a terrestrial ecologist. For her PhD, Linda examined the ecology of the Tall Astelia. Following her PhD, Linda has continued to work on the species including genetic analysis across its range, conservation translocations, and the 30 -year monitoring of the species abundance.

Tall Astelia (Astelia australiana) is a threatened rainforest herb endemic to southeastern Australia (Victoria). The species is continuing to decline with over 68 % decline of individuals in monitored populations over the last 30 years (1993-2023).
There are multiple threats to the species including plant pathogens, wildfire, herbivory from introduced herbivores, and climate change (Parker 2018). In addition, the species abundance and survival within the rainforest is limited by low light availability below the canopy (Parker 2018).
54 individuals were collected from one wild population as a trial translocation and planted into three recipient sites. This trial was a success and so was extended to translocate a further 200 individuals from six source sites. These plants were planted into four new sites to extend the species range and to reduce the risk of a single large wildfire from killing a large proportion of the population (as happened in 2009). One site used in the trial translocation was also increased in size. A fifth site was translocated into and fenced to replace a population that had been heavily browsed (Parker and Nitschke 2019, 2020).
The translocations had mixed success with good overall survival of translocated individuals (80%) after 5 years, and reproduction in three of the translocated populations and subsequent population growth in those sites.
Further translocations are required to reduce the ongoing threats to this species. These translocations will be informed by the coupling of our genetic analysis results of the species across its range and our species distribution model.

Beyond fencing in the Wild Desert: innovation and challenges in establishing in-situ predator awareness training for reintroduced mammals

Dr Reece Pedler[1], Dr Rebecca West[1], Associate Professor Katherine Moseby[1], Dr John Read[2], Ms Catherine Lynch[1], Mr Thomas Hunt[1], Professor Richard Kingsford[1]
[1]UNSW Sydney, Wild Deserts, Sturt National Park, Australia, [2]Ecological Horizons, Kimba, Australia

Biography:
Dr Reece Pedler lives and works as the Project Co-ordinator for the Wild Deserts partnership in the Strzelecki Desert. He is passionate about the conservation of Australian desert ecosystems and the unique species that characterise this dynamic environment.

Overgrazing by native and introduced herbivores and predation by introduced cats and foxes are major contributors to mammal decline and extinction in arid Australia. Fenced conservation safehavens exclude these threats but exacerbate the issue of prey naivety and can lead to overabundance of reintroduced species. At the Wild Deserts site in Sturt National Park NSW, we used a different approach. This aims to allow animals to gradually transition from fenced safehavens, where predators and competitive herbivores are completely excluded, to a 10,000ha 'Wild Training Zone' surrounded by a leaky fence where animals are exposed to low densities of these threats. This low-level exposure has been shown to lead to advantageous changes in physical and behavioural traits in reintroduced mammals in previous experiments. Maintaining low levels of feral cats, foxes and native herbivores such as kangaroos in the large Wild Training Zone is challenging in a dynamic boom-bust desert climate. We outline a variety of methods used including one-way gates, felixer grooming traps, and baiting to limit feral cats, foxes and

kangaroos to predetermined population thresholds. Over 36-months, one-way gates facilitated the exit of 227 kangaroos from the training zone, maintaining the target density of >2 kangaroo/km2 (1% of mean control density). During a 12-month trial Felixer grooming traps fired at 103 cats, limiting cat activity to 20% of the control treatment outside; a step in facilitating planned releases of bilbies, quolls and boodies into the training zone. Restoring native Australian mammals outside fences requires experimental approaches and adaptive solutions.

Understanding the political, social and economic barriers to species reintroduction

Erin Phillips[1], Dr Robert Pringle[1], Dr David Wilcove[1]
[1]Princeton University, Princeton, United States

Biography:
I am a PhD candidate in Ecology and Evolutionary Biology at Princeton University. I primarily study the impacts of apex carnivore reintroduction on savanna ecosystems, and particularly on smaller mesocarnivores, but as a science, technology and environmental policy fellow, I am also interested in the policy dimensions of conservation translocation.

Reintroductions of animal species for conservation purposes have been responsible for some of the 21st century's most high-profile conservation successes. Despite this, reintroductions often fail. While understanding a species' ecology is key to successful translocation, recent reviews have also identified socio-political issues as a major barrier to species reintroductions globally, perhaps due to stakeholder misalignment, political and economic instability, or failure to accurately assess the social landscape prior to reintroduction. To examine these issues, we conducted a meta-analysis of in the IUCN CTSG Global Conservation Translocation Perspectives reports (2008-2021) to identify the key political, social and economic barriers to species reintroductions globally. We compiled information of conflicts between parties, identifying who conflicts occurred between (e.g. government, landowners, members of the public, commercial businesses), the cause of the conflict (e.g. threat to livelihood by the translocated animal, threat to personal wellbeing, threat to industry, cultural objection), if the conflict was mitigated and if so how (e.g. education, outreach, engagement, financial compensation, publicity campaigns) and translocation success. Using this database, we investigated 1) the most common political, social and economic challenges faced and their impacts on reintroduction success, 2) the specific socio-political challenges associated with particular taxa (e.g. large predators) and 3) geographic trends in political, social and economic barriers. Synthesising across case studies, we propose possible solutions and strategies for navigating these barriers moving forward, in the hopes that past mistakes may inform future successes in socio-ecological development.

Genetic diversity targets when recovering threatened species through rebuilding metapopulations

Dr Jennifer Pierson[1], Prof Nicola Mitchell, Dr Amanda Bourne, Dr. Steve Cooper, Dr. Mark Eldridge, Dr Kym Ottewell, Ms Kate Rick, Dr. Emily Roycroft
[1]Australian Wildlife Conservancy, Subiaco East, Australia

Biography:
Dr. Jenny Pierson is a population ecologist interested in the challenges faced by small populations. She specialises in conservation genetics, participating in several international working groups to

improve the application of genetics in conservation. Her goal is to apply scientific principles to the conservation and management of threatened species.

Genetic diversity has long been acknowledged as an important management consideration in conservation translocations. Initially, conservation programs aimed to capture 90-95% of the diversity of source populations. As the field of translocation has matured and the practice has become largely routine, more sophisticated genetic objectives have been developed, such as an effective population size (Ne) >500/1000 and metapopulation management. In parallel, a paradigm shift has occurred from prioritizing locally sourced founders towards maximizing diversity through multi-source founding populations as the risk of outbreeding is generally low and the risks of inbreeding and low adaptive potential are much higher. However, many reintroduced populations may never reach a large enough Ne to prevent drift and re-establishing natural connectivity to conspecific populations is not always possible. This raises the questions of how much diversity is enough and when is genetic management needed in translocated populations. Here, we describe a framework of genetic metrics and targets that can be applied to metapopulation management for threatened species being restored through translocations. The framework outlines conceptual targets for single populations in a metapopulation network, including the metrics and thresholds that apply for monitoring success in single translocations and triggering actions such as genetic supplementation. Additionally, conceptual targets and metrics to evaluate the genetic health of the metapopulation will be detailed, drawing on several Australian mammal examples. As conservation translocations become more common, strategic metapopulation management is becoming central to successfully recovering species and effectively conserving their remnant genetic diversity.

Midazolam has no benefit over azaperone as a stress reducing drug during white rhinoceros (Ceratotherium simum) transportation

Dr Friederike Pohlin[1,2,3], Peter Buss[2,4], Emma Hooijberg[2,5], Maria Fabregas[3], Nikolaus Huber[6], Francois Viljoen[7], Tanita Botha[8], Leith Meyer[2,3]

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Biography:

Dr. Friederike Pohlin is a wildlife veterinarian and researcher at the Research Institute of Wildlife Ecology of the University of Veterinary Medicine Vienna. Her current research is directed towards improving wild animal immobilisation and the assessment of stress and animal welfare during wildlife translocation.

Translocations are essential for rhinoceros conservation. Despite their wide use and importance, these practices are associated with stress that may ultimately lead to translocation failure. Therefore, stress-reducing techniques are required.

Here we used blood-, physiological- and behavioural-variables to quantify stress responses on different time-scales. Our aim was to investigate whether the anxiolytic drug midazolam was

able to reduce stress responses compared to azaperone, a tranquilizer which is more commonly used.

Twenty-three wild white rhinoceros bulls were transported for six hours (280 km) and sedated with either azaperone or midazolam. Serial blood samples were collected from an auricular vein at the start of transport, and after two, four and six hours of transportation. Rectal body temperature (iButton®) and cardiac electrical activity (POLAR® Equine heart rate monitor) were measured every 10 minutes throughout transportation. Rhinoceros behaviour was recorded every minute (GoPro®). Changes in measured variables over time and between groups were compared using linear mixed models with random intercept per individual.

Serum catecholamines decreased over time ($p<0.001$). Cortisol and leukocyte coping capacity (area under the curve) decreased after peak plasma concentrations were reached at two- and four-hours of transportation, respectively ($p\leq0.001$). Body temperature and heart rate continuously decreased, and heart rate variability continuously increased over time ($p<0.001$).

Although not statistically significant, across all variables midazolam sedated rhinoceroses tended to have greater stress responses. Midazolam animals appeared calmer, but lay down more than azaperone animals ($p<0.001$). These findings indicate that midazolam is not superior to azaperone in reducing stress responses to transportation.

Learning from past translocations and conservation programs to reintroduce the Eastern Bristlebird to Wilsons Promontory in south-eastern Australia

Dr Dean Portelli[1]
[1]NSW National Parks and Wildlife Service, Dubbo, Australia

Biography:
Dean Portelli has worked in various roles related to the conservation of Australian wildlife for over twenty years. His experience with conservation translocations includes on-ground delivery, planning and approvals.

Conservation translocations of animals are costly, and success is not guaranteed. Applying learnings from past translocations to improve the likelihood of success is therefore highly desirable. We planned an ambitious reintroduction program, which is being collaboratively delivered by government and non-government organisations, to translocate Eastern Bristlebirds to Wilsons Promontory in south-eastern Australia. The lessons learned from two previous wild-to-wild translocations, two wild-to-captive translocations, a captive-breeding program and long-term population monitoring of Eastern Bristlebirds provided a strong foundation for planning a more complex wild-to-wild translocation of this species. Extensive consultation with the conservation practitioners involved in these projects informed key planning decisions, including staging translocations, determining founder size, selecting a release site, and formulating metrics and thresholds for evaluating success. Learnings were also applied to refine translocation procedures for Eastern Bristlebirds. The reintroduction program is on track to being successful, with high survival of founders during translocation and in the immediate and short terms following release, moderately high fidelity to the release site, and recruitment observed during the first breeding season following release. Our case study highlights the benefits of applying past learnings to mitigate risks and improve the likelihood of success when planning and delivering translocations.

Using eDNA to identify future translocation sites for the Gilbert's potoroo

Ms Rebecca Quah[1], Dr Robert Davis[1], Dr Jackie Courtenay[2], Dr Harriet Mills[3], Dr Anna Hopkins[1]
[1]Edith Cowan University, Joondalup, Australia, [2]Gilbert's Potoroo Action Group, Albany, Australia, [3]Perth Zoo, Department of Biodiversity, Conservation and Attractions, South Perth, Australia

Biography:
Bec is a wildlife ecologist in research and consulting with interests in vertebrate fauna, conservation translocations, ecological restorations and the use of molecular tools. They are presently undertaking a PhD at Edith Cowan University looking at the conservation of the Gilbert's Potoroo (Ngilgyte).

Since the rediscovery of the Gilbert's potoroo (Potorous gilbertii) in 1994, translocations have been undertaken to insure the only remnant population in Two Peoples Bay on the south coast of Western Australia. At present, an estimated 120 individuals persist across four locations as a result of translocation successes. However, predation, anthropogenic climate change, as well as limited carrying capacity and gene flow across the population continues to pose issues for the species' recovery. Further translocations to mainland sites have been identified as a priority but the potoroos' unique diet and habitat requirements make selecting a suitable site a challenge. The species depends on hypogeous fungi that make up over 90% of its diet and current methods to determine habitat suitability include unreliable and labour-intensive manual searches for these fungi in proposed locations. This study seeks to refine these methods by using environmental DNA (eDNA) techniques. Next-generation sequencing will allow us to compare fungi consumed by the potoroos to the fungi that are available in their known habitats. Plant-growth trials will also aid in the identification of vegetation associated with potoroo's preferred fungi, thus providing information on the dietary and habitat requirements of the species. eDNA techniques will then be applied to potential translocation sites to determine the abundance and diversity of hypogeal fungi in the area and inform its feasibility to sustain future populations of the Gilbert's potoroo.

Past and present of conservation translocations in Galapagos. What can we change for the future: The Floreana mockingbird reintroduction case

Dr Enzo M R. Reyes[1], Dr Luis Ortiz Catedral[2]
[1]Massey Univeristy, Albany, Auckland, New Zealand, [2]World Parrot Trust, Hayle TR27 4HB, UK

Biography:
Dr Enzo Reyes is an Ecuadorian early career conservationist. He got his PhD in Conservation Biology at Massey University investigating how behavioural aspects could influence the future reintroduction of the Floreana Mockingbird to Floreana Island. Enzo also worked for the DOC in the recent translocation of the Black Robin.

The Galapagos Islands are considered one of the most pristine archipelagos in the world. Despite their unique biodiversity and relatively undisturbed habitat, the archipelago faces the same threats as other islands. Human colonization on the islands has caused the extinction of several species by a combination of direct human pressure, the introduction of invasive species and habitat change. To mitigate the loss of biodiversity on the islands, the Galapagos National Park and The Charles Darwin Foundation have been performing a series of reintroductions and assisted colonization of vertebrates. Nevertheless, the rates of success have been higher for reptiles' translocations mainly giant tortoises than for birds. Several factors including poor planning and decision-making account for the failure of bird translocations. The Floreana Island

Restoration Project, which aims to reintroduce 13 locally extinct vertebrate species to Floreana (the most impacted island on the archipelago), brings an opportunity to assess the methods used in previous translocations on the archipelago and correct mistakes. Here we review past translocations on the islands and focus on the proposed reintroduction of the endangered Floreana mockingbird as a study case. We discuss how the knowledge gathered for the species during the last years could help to improve the decision-making process and the outcome of the species' reintroduction.

Using decision analysis to assess the feasibility of recovery of northern leopard frogs using conservation translocations in northern Idaho, USA

Ms Lea Randall[1], Ms Laura Keating, Rebecca Stanton, Casey McCormack, Michael Lucid, Dr. Travis Seaborn, Dr Sarah Converse, Dr. Stephano Canessa, Dr Axel Moehrenschlager
[1]Wilder Institute/ Calgary Zoo, Calgary, Canada

Biography:
Lea A. Randall, MSc., is the interim Senior Manager of Conservation Translocations and has worked as a population ecologist at the Wilder Institute/ Calgary Zoo for the last 12 years. She received her BSc in Biology from the University of Victoria and MSc in ecology from the University of Calgary.

Conservation translocations, have increased thirty-fold over the last three decades and are projected to increase further a biodiversity loss continues worldwide. The literature abounds with analyses to inform translocations and assess whether they are successful, but the fundamental question of whether they should be initiated at all is rarely addressed formally. We used decision analysis to assess northern leopard frog reintroduction in northern Idaho, USA, with success defined as a population that persists for at least 50 years. Along with other considerations, the Idaho Department of Fish and Game will use this assessment in the future to make a decision regarding reintroduction of northern leopard frogs. Stakeholders from government, indigenous groups, academia, land management agencies, and conservation organizations also participated. We built an age-structured population model to predict how management alternatives would affect probability of success. We accounted for both parametric uncertainty and stochasticity (environmental and demographic) in the model, which allowed us to explicitly represent uncertainty around the probability of success and to assess the sensitivity of predicted outcomes to uncertainty. For the leading alternative, results were bimodal, with most parameter combinations resulting in either very low (95%) probabilities of success. Overall, the results of this feasibility assessment suggest that a successful reintroduction of northern leopard frogs is possible but far from certain, with the uncertainty primarily driven by uncertainty surrounding survival of early life stages. Conservation translocations would benefit greatly from more widespread use of decision analysis to counter the complexity and uncertainty inherent in these decisions.

Habitat suitability and reintroduction site selection for the northern leopard frog (Lithobates pipiens) in British Columbia, Canada

Ms Lea Randall[1], Rebecca Stanton
[1]Wilder Institute/ Calgary Zoo, Calgary, Canada

Biography:
Lea A. Randall, MSc., is the interim Senior Manager Conservation Translocations at the Wilder Institute/ Calgary Zoo and has worked as a population ecologist for the last 12 years. She received

her BSc. in biology from the University of Victoria and MSc. in ecology from the University of Calgary.

There currently exists only a single extant population of northern leopard frogs in British Columbia (BC), Canada, and past reintroduction attempts have met with limited success. As a result, the BC Northern Leopard Frog Recovery Team initiated a search for a new reintroduction site in 2021 through the development of quantitative assessment tools. This involved establishment of a Habitat Suitability Index (HSI) model and a Site Selection Criteria table based upon the unique habitat requirements of the northern leopard frog in BC. The HSI model spatially filtered for suitable habitat within the historical range based on attributes such as elevation, number of waterbodies, solar exposure, road density, etc. Any potentially suitable locations detected by the HSI were further filtered during a preliminary desktop assessment whereby clearly unsuitable sites (e.g., located in heavily forested areas or with significant barriers between habitat types) were eliminated. Concurrently with the HSI, a Site Selection Criteria table was developed. Use of this table involves scoring each site for numerous habitat attributes important for the northern leopard frog in the overarching categories of breeding habitat, foraging habitat, overwintering habitat, connectivity, and land use/other. On-the-ground field visits were completed at all suitable sites in spring, summer, and fall in order to collect the relevant data to allow for scoring of each site in the Site Selection Criteria table. We found these methods to be an effective way to quantitatively compare and
select a new reintroduction site.

Reducing competition by a priority species to increase translocation success. The challenges of Tammar Wallaby eradication on North Island

Mr Michael Raykos[1]
[1]Department of Biodiversity Conservation and Attractions, Geraldton, Australia

Biography:
Michael Raykos is the Conservation Coordinator in the Murchison district for DBCA. Having worked across Western Australia in coastal and arid regions, he has coordinated and implemented operations for the department relevant to feral animal control, fire management and conservation.

Guaranteed funding, community support and adaptability to unforeseen risks are critical in achieving competitor eradication to support future translocations. The Abrolhos painted button-quail (Turnix varius scintillans) (APBQ) has been identified as one of the most imperilled birds in Australia, with a probability of extinction of around 70% in the next 20 years. It is a small ground-dwelling bird with a resident distribution restricted to three small islands of the Houtman Abrolhos archipelago off the west coast of Western Australia, including North Island.

Tammar Wallabies (Notamacropus eugenii) are a priority 4 protected species In WA. Introduced by resident fishermen to North Island, first in the 1920s which did not persist, but most recently in 1985 which subsequently established. A significant decline in vegetation ensued and the local extinction of APBQ followed. Between 2007-2009 control measures on Tammars including fertility control, culling, and trapping were undertaken reducing the population to an estimate of 50-70 animals. Eradication subsequently failed due to lack of ongoing funding and the population rebounded.

The project was reinstated in 2018 with guaranteed ongoing funding to eradicate Tammar wallabies. The first necessity was met, however community and political values over the decade had changed leading to increased scrutiny on approvals and the need to regain community support after the previous failed attempt. COVID 19 arrived in the middle of the operation and

the ability to access the island was no longer guaranteed. Flight and vessel movements became restricted, planned trips were cancelled at last minute due to the fishing industries profitability taking precedence, and the Tammars continued to breed. The challenge of finding and removing the final animals was further complicated by the strong recovery of vegetation reducing the ability to successfully track individuals. Adaptability to these new challenges whilst keeping the local community on side was crucial in continuing the operation to achieve eradication.

Exploring artificial propagation and translocation opportunities for kanakana (pouched lamprey, Geotria australis) in Aotearoa-New Zealand

Dr Aisling Rayne[1], **Dr Matthew Wylie**[2,3], Mollie Lyders[2,4], Riki Parata[4,5], Tāne Tamati[4,6], Dr Helen Warburton[7], Dr Jane Kitson[2,8]
[1]Cawthron Institute, Nelson, New Zealand, [2]Ngāi Tahu, Ngāti Māmoe, Waitaha, [3]The New Zealand Institute for Plant and Food Research Limited, Nelson, New Zealand, [4]Hokonui Rūnanga Kaupapa Taiao, Gore, New Zealand, [5]Ngāi Tahu, Te Atiawa ki Whakarongotai, [6]Ngāi Tūhoe, Ngāi Tahu, Ngāti Māmoe, Waitaha, [7]School of Biological Sciences, University of Canterbury, Christchurch, New Zealand, [8]Kitson Consulting Ltd, Invercargill, New Zealand

Biography:
Matt is a scientist specialising in aquaculture/captive breeding and reproductive technologies for fish. He approaches his work using both Western and Indigenous (Māori) knowledge systems. Aisling is a critical social scientist with training in conservation genomics and community-based research. She currently works across human geography, transdisciplinary conservation science and STS.

Kanakana, also known as piharau or pouched lamprey (Geotria australis), are an important traditional food source for Māori (the Indigenous Peoples of Aotearoa-New Zealand). This ancient, migratory fish is rapidly declining across Aotearoa-NZ because of threats such as habitat loss, migratory barriers and poor water quality. Moreover, conservation legislation for native freshwater species like kanakana is fragmented, and generally side-lines Māori rights and knowledge. As tāngata tiaki (guardians) of this taonga (treasured) species, several Māori communities are leading efforts to recover local kanakana populations through programmes which address multiple (biophysical/ecosystem, social, cultural, legislative) domains in interconnected ways. Our research explores artificial propagation and translocation opportunities for kanakana in partnership with Hokonui Rūnanga and First Nations communities of North America, who are actively involved in the conservation of their lamprey species. By centring Indigenous expertise and aspirations, this work aims to understand the technical, social and cultural aspects of captive breeding and translocating lamprey, including the development of a framework embedded in Te Ao Māori (Māori worldviews, including customs and protocols). We anticipate this work will guide future conservation efforts for kanakana locally and bring global attention to more just and holistic translocation approaches.

Illuminating the social dimensions of genetic principles in conservation translocation decision-making

Dr Aisling Rayne[1], Dr Axel Moehrenschlager[2], Professor Tammy Steeves[3]
[1]Cawthron Institute, Nelson, New Zealand, [2]Conservation Translocation Specialist Group, IUCN SSC, [3]University of Canterbury, School of Biological Sciences, Christchurch, New Zealand

Biography:

Aisling is a social scientist with training in conservation genomics and community-based research. She currently works across critical environmental geography, transdisciplinary conservation, and science and technology studies.

For researchers, practitioners and communities, conservation translocation decision-making raises questions about what we value, including what 'belongs'. While there is general recognition that these interventions are values-based social and political processes, this has not yet been extended to the application of genetic principles in conservation translocations. In this talk, we explore the complex interface of genetic research and conservation translocation practice. Drawing from a range of animal case studies, we canvas different norms and values which underpin the use and interpretation of genetic data. We consider how these norms and values might shape diverse perspectives on 'good' and 'bad' conservation translocation decisions, and in some cases, create contention. We conclude with a series of considerations intended to foster more reflexive and deliberative dialogue—and more contextually-responsive decisions—about the application of genetic principles to conservation translocations.

Juggling population divergence and genetic mixing in translocations

Ms Kate Rick[1], Dr Kym Ottewell[1,2], Dr Kenny Travouillon[3], Prof Nicola Mitchell[1]
[1]The University of Western Australia, Crawley, Australia, [2]The Department of Biodiversity, Conservation and Attractions, Kensington, Australia, [3]The Western Australian Museum, Welshpool, Australia

Biography:
Kate is a PhD candidate at UWA, interested in molecular ecology and its application to conservation practices. Her research focuses on genetic and morphological patterns in Australian mammals, the underlying evolutionary mechanisms driving these patterns, and how such information can support management decisions, especially in regard to genetic mixing.

Over 20% of Australian endemic land mammals are at risk of extinction, with many restricted to small populations on continental islands which may harbour unique genetic and phenotypic variation. In the past, managers have generally avoided crossing divergent populations because of the perceived risks of outbreeding depression. Yet, mixing source populations in reintroduction programs is increasingly advocated to maximize genetic diversity. We investigate the potential application of mixing mainland and island populations in the dibbler (Parantechinus apicalis); a threatened dasyurid restricted to Western Australia at just one mainland site and two small offshore islands – Boullanger Island and Whitlock Island. With previous research projecting a continuing decline in genetic diversity over the next century, we combine morphometrics with genomics to gain a better understanding of population divergence in the dibbler. Preliminary analyses using 20,615 SNPs across 159 individuals show substantial genetic differentiation between populations (pairwise-FST values ranging from 0.04 – 0.67) with two genetic clusters reflecting the mainland and island populations. The majority of remnant genetic diversity is harboured in the mainland population. We use the TreeMix model to investigate the amount of genetic drift along each population as well as the contribution of natural selection to intra-population divergence by comparing phenotypic variation (PST) and genetic variation (FST). We also explore whether the relative contribution of natural selection and genetic drift can be incorporated into existing population viability models to determine the effect evolutionary processes can have on population viability, particularly in the context of genetic mixing in reintroductions.

WildTrack: A long range (LoRa) radio and Internet of Things (IoT) system for passive tracking of translocated wildlife

Dr Kylie Robert[1], Ms Kelly Williams-Kelly[1], Dr Robert Ross[1], Mr Ben Anderson[1], Ms Kelly Rayner[2], Dr Saul Cowen[2]
[1]La Trobe University, Bundoora, Australia, [2]Department of Biodiversity, Conservation and Attractions, Perth, Australia

Biography:
Kylie is a zoologist with a broad interest in reproductive ecology and conservation biology.

https://robertlab.com/

Surveying translocated wildlife is an essential part of post release monitoring to determine success. Post release tracking and monitoring of translocated wildlife is typically labour intensive and challenging in species that a small, cryptic, nocturnal or difficult to re-capture. Here we evaluate WildTrack, a long range (LoRa) radio and Internet-of-things (IoT) based tracking system which automatically logs microchipped individuals and wirelessly uploads data to the cloud for remote access. A total of 40 WildTrack modules were deployed at Gary's Beach on Dirk Hartog Island, Western Australia between May 2022 – May 2023 targeting translocated greater stick nest rats (Leporillus conditor). The WildTrack system runs continuously, and as of April 2023 yielded 2,023 detections from 30 modules. Two modules failed completely, and 8 modules failed to detect any individuals despite continued communication with the gateway, suggesting poor placement of antennas. WildTrack detected three species of translocated mammal, with Shark bay bandicoots (Perameles bougainville, 1,824 detections of 33 individuals) occurring most frequently, followed by greater stick nest rats (Leporillus conditor, 97 detections of 13 individuals) and rufus hare wallaby (Lagorchestes hirsutus, 102 detections of 2 individuals). We show that WildTrack allowed for non-invasive identification and location of individuals which will provide easily accessible data on survival and movement in the landscape. The system is highly scalable with 100's of modules able to connect to a single LoRa gateway enabling the future use of long-distance arrays to increase detection rates, examine dispersal distances and determine home ranges of more mobile species.

Conservation translocations in NSW national parks

Mr David Rudder[1]
[1]NSW National Parks and Wildlife Service, Parramatta, Australia

Biography:
David Rudder is NPWS Manager, Feral Predator-free Area Partnerships with qualifications in wildlife management, architecture and project management, and expertise in the design, construction and program management of predator-free areas and captive breeding facilities. David currently manages threatened species translocation projects in partnership with UNSW/Wild Deserts and Australian Wildlife Conservancy.

Under the Threatened Species Framework for zero extinctions on park, the NSW National Parks and Wildlife Service is creating a network of feral predator-free areas, covering 65,000 hectares across the NSW national park system, and is separately undertaking koala translocations and brush-tailed rock-wallaby assisted movements within the national park system.
Three current project sites, covering nearly 20,000 hectares, were developed under a partnership model between NSW government and the non-government sector. By the end of 2023 these projects will account for 19 translocations of 12 species of mammal currently listed as extinct in NSW. Four new project sites will triple the area under protection to accommodate additional translocations of NSW extinct species and provide conservation benefit for at least 50 threatened animal species.

These projects demonstrate how partnerships and different models of partnership are critical to successful conservation translocations and ongoing threatened species management.
Model 1: Government + one

- Government enters into formal long-term partnerships with large-scale conservation organisations (AWC and UNSW), that provide the resources and expertise in design and construction, feral predator removal, sourcing and translocations, ongoing monitoring and surveillance. These large NGOs, in turn, manage a number of discrete partnerships to complete these tasks.

Model 2: Government + many

- Government works closely with specialist organisations for predator-proof fence design, construction, pest removal, sourcing wild founders, captive breeding, animal health and translocations.

Model 3: Intra-government

- Partnerships between government departments and teams to achieve targeted translocation and assisted movement of animals within the national park system.

Advancing assisted colonization: A case study on Isoëtes cangae and the implications for conservation of this endemic Amazonic Macrophyte

Dr. Rodrigo Lemes[1], Dr. Emiliano Calderon[1], Mr Fernando Santos[2], Mr. Allysson Cavalcante[2], Dr. Cecilio Caldeira[3], Dr. Guilherme Oliveira[3], Dr. Francisco Esteves[1], Ms. Daniela Scherer[2]
[1]Instituto de biodiversidade e sustentabilidade (NUPEM/UFRJ), Macaé, Brazil, [2]Vale S.A., Belo Horizonte, Brazil, [3]Instituto Tecnológico Vale Desenvolvimento Sustentável (ITVDS), Belém, Brazil

Biography:
Rodrigo is a biologist with a Ph.D. in pollination ecology and genetic variability. Since 2009, he is a professor at the Institute of Biodiversity and Sustainability (NUPEM/UFRJ). Rodrigo specializes in Socio-Environmental Development and Evolutionary Ecology, managing interdisciplinary projects. He actively advises Conservation Units and Municipal Councils, representing NUPEM and UFRJ.

The risk of species extinction has escalated due to rapid and extensive ecosystem changes occurring worldwide. To avert further losses, significant strides have been made within the scientific community to develop protocols for plant translocations that account for the biology of native species and the ecological characteristics of recipient environments. We present a case study focusing on Isoëtes cangae, an endemic species confined to an unique lake in the Brazilian Amazon. A diverse array of management techniques was developed to conserve and support future demands of the species translocation. Since 2017, comprehensive investigations have been undertaken to comprehend the species' ecology and the potential recipient sites. The physical, chemical, and biological attributes of these environments were assessed to discern their impact on the growth and development of I. cangae. This knowledge not only enhanced understanding but also facilitated predictions of potential impacts arising from management interventions, while aiding in the evaluation of their effectiveness. Assisted colonization experiments initiated in 2019, before ensuring environmental safety for both the target species and the receiving habitats. Furthermore, studies involving assisted colonization in environments with contrasting characteristics provided valuable insights into the physiological limits of the species, thereby establishing a comparative baseline for future assisted introduction endeavours. The findings of these studies are crucial for the conservation of endemic aquatic macrophytes in Brazil and other regions. By carefully considering biological and ecological factors and implementing targeted management strategies, effective conservation of endangered species can be achieved even within rapidly changing environments.

Mitigation Translocation Challenges in Vale's Amazon Operations: Mitigating in the Absence of Specific Policies

Mr Fernando Santos[1,2], Ms. Mariana Wardil[3], Dr. Fernando Silveira[2], Mr. Allysson Cavalcante[1], Dr. Tais Fernandes[1], Mr. Leandro Maioli[1], Ms. Daniela Scherer[1]
[1]Vale S.A., Belo Horizonte, Brazil, [2]Universidade Federal de Minas Gerais - UFMG, Belo Horizonte, Brazil, [3]Amplo Engenharia, Belo Horizonte, Brazil

Biography:
Fernando is an experienced Botanist focused on the ecology of rare endemic plant species. Currently is an environmental analyst at Vale S.A., where he researches plant translocations in Carajas National Forest. Fernando is pursuing a PhD to develop conceptual and practical approaches for implementing Mitigation translocations in the Brazilian context.

Mining activities in mega-diverse countries pose significant challenges to critical biodiversity attributes, such as habitats, plants, and cave troglobites. The lack of specific environmental legislation that regulates mitigation hierarchy, no net loss, and translocation practices further aggravates the situation. Unlike countries as Canada, USA, Australia, England and France, which have established recognized guidelines and protocols for mitigation translocation, Brazil lacks a comprehensive framework, relying instead on individual environmental agency reports. In a recent attempt to translocate endemic species, Vale´s faced environmental restricts imposed by the environmental agency due to the lack of explicit regulatory policies. Here, we report mitigation translocation challenges in iron ore mining operations by Vale S.A. in the Brazilian Amazon. Efforts have been implemented aiming at rescuing and reintroducing endangered plant species affected by ongoing mining operations. However, compliance with environmental conditions set forth by regulatory frameworks alone does not guarantee successful conservation outcomes, as proved by the environmental conditions' compliance reports. This study focuses on case studies of five endemic plant species associated with iron rock outcrops, where a comprehensive approach has been adopted, encompassing ecological, demographic and propagation studies, to better inform experimental mitigation translocations. Our results show that the anticipation of ecological practices improves the effectiveness of mitigation translocation projects, highlighting the need for a more robust and comprehensive regulatory framework regarding mitigation hierarchy and translocation practices in Brazil. Ultimately, the goal is to ensure the long-term conservation of biodiversity in the face of mining operations' negative impacts.

Applications of SHERLOCK, a sensitive and rapid CRISPR-Cas13a genetic identification platform, for conservation translocation programs

Dr Andrea Schreier[1], Dr. Emily Funk[1], Dr. Sean Canfield[1], Dr. Ravi Nagarajan[1], Dr. Melinda Baerwald[2]
[1]University of California Davis, Davis, United States, [2]California Department of Water Resources, West Sacramento, United States

Biography:
Andrea is a molecular ecologist who uses genetic/genomic techniques to answer ecological questions about fish and wildlife, often with direct relevance to management and conservation.

Specific High-Sensitivity Enzymatic Reporter UnLOCKing (SHERLOCK) is a CRISPR-Cas13a genetic detection platform originally developed for point-of-care pathogen detection that our laboratory has adapted for conservation applications. SHERLOCK can be used to genetically identify species or evolutionary lineages (e.g. subspecies, ESUs) that possess diagnostic genetic

differences, including single nucleotide polymorphisms (SNPs). A SHERLOCK reaction indicates the presence of a taxon-specific genetic sequence in a biological sample by cleaving fluorescently labeled reporter RNA. This fluorescence can be detected with an inexpensive, portable fluorescence reader. SHERLOCK reactions are isothermal (no need for a thermal cycler), as sensitive as qPCR, rapid (results in 25 minutes or less), inexpensive (< $2 per reaction), and in some cases, do not require a DNA extraction. Once assays are developed, they can be performed by non-geneticists with minimal training and applied in non-laboratory settings. Thus, SHERLOCK has great potential to facilitate species identifications and post-release monitoring within conservation translocation programs operating in remote locations. One promising application of SHERLOCK is in situ disease screening of individuals prior to translocation, particularly for diseases that can be detected from skin, buccal, or rectal/cloacal swabs. SHERLOCK could also be used to detect eDNA or eRNA as a low cost monitoring tool complementing "traditional" post-release monitoring approaches. This poster will delve into the benefits of SHERLOCK and other CRISPR-based approaches, describe current conservation applications, and highlight potential future uses of greatest interest to conservation translocation practitioners.

Evaluating the success of assisted colonisation trials to the Cocos (Keeling) Islands for an Extinct in the Wild skink

Ms Kristen Schubert[1], Mr Brendan Tiernan[1], Prof Nicola Mitchell[2], Ms Alexia Jankowski[1], Ms Trish Flores[1], Dr Megan Barnes[2,3], Dr Jon-Paul Emery[2,4]
[1]Parks Australia, Christmas Island, Australia, [2]University of Western Australia, Perth, Australia, [3]Department of Biodiversity, Conservation and Attractions, Perth, Australia, [4]University of Southern Queensland, Toowoomba, Australia

Biography:
Kristen Schubert (MSc, UWA) Threatened Species Officer of Christmas Island National Park. I have been monitoring the post-release survival, population growth and habitat usage of an Extinct in the Wild skink endemic to Christmas Island, that was translocated to the Cocos (Keeling) Islands in an assisted colonisation trial in 2019.

The Christmas Island blue-tailed skink (Cryptoblepharus egeriae) is Extinct in the Wild (IUCN) due to introduced predatory species and has been bred in captivity for over a decade. Assisted colonisation trials to two of the Cocos (Keeling) Islands, Pulu Blan and Pulu Blan Madar (980 km south-west from Christmas Island), took place in September 2019 and March 2020, each involving the introduction of 300 skinks bred in captivity. We aimed to evaluate the suitability of these two islands as potential sites to support a self-sustaining blue-tailed skink population, by monitoring skink survival, reproduction, and habitat use. The trial on Pulu Blan met two of four pre-determined metrics for success: (1) signs of mating and reproduction at six-months post-release, and (2) survival to six-months of age of skinks born on the island. However, initial survival was much lower on Pulu Blan Madar, where a previously undetected super-colony of yellow crazy ants (Anoplolepis gracilipes) appeared to kill skinks and drive their dispersal to the edge of vegetated habitat. Baiting efforts on Pulu Blan Madar successfully reduced the number of yellow crazy ants to low-detectability, and the surviving skink population began to show signs of recovery. A top-up translocation of an additional 250 skinks took place in June 2021. Given the challenges in controlling invasive species on Christmas Island, and the high costs of maintaining a captive breeding program, assisted colonisation of blue-tailed skinks to the Cocos (Keeling) Islands is a feasible option for establishing self-sustaining populations of this species outside of captivity.

What does Rewilding have to do with Reintroductions - or vice versa

Professor Philip Seddon[1]
[1]University of Otago, Dunedin, New Zealand

Biography:
Phil Seddon is a Professor in the Department of Zoology at the University of Otago. He has been involved in conservation translocation planning, policy, application, and training, and member of the IUCN/SSC Conservation Translocation Specialist Group for over 30 years

Rewilding as a conservation approach was conceived back in 1998 as the translocation of top-order predators into large connected areas of protected wilderness - cores, corridors, and carnivores. Since that time rewilding has become all things to all people, from the unmanipulated recovery of abandoned agricultural land, to the active restoration of key fauna. Rewilding in the current context overlaps with Reintroduction Biology and Restoration Ecology, but these interactions are not always clearly delineated. In this talk I will summarise recent work in which I explored the role of conservation translocations in rewilding, placed rewilding within the conservation translocation spectrum, and defined the intersections between rewilding, reintroduction, and restoration.

Reintroductions, rewilding and ecological restorations

Professor Philip Seddon[1]
[1]University of Otago, Dunedin, New Zealand

Biography:
Phil Seddon is a Professor of Zoology at the University of Otago, New Zealand, and a member of the IUCN/SSC Conservation Translocation Specialist Group

Conservation translocation, including reintroduction, has developed as an important conservation tool, though largely separately from the field of ecological restoration, but both intuitively seem to have something in common with the increasingly popular rewilding movement. Rewilding was originally narrowly defined around cores, corridors and carnivores, but has recently become a diverse and growing set of projects worldwide that sometimes involve conservation translocations and ecosystem restoration. I review the history and range of activities that fall under the label "rewilding", examine the role of conservation translocations in global rewildling projects, and attempt to define the intersection between conservation translocation, ecological restoration, and rewilding.

Different good or different bad? Managing the risks of hybridisation and the benefits of genetic diversity within conservation translocations

Dr Helen Senn[1,2,4], Dr Alex Ball[2], Dr Kara Dicks[2], Dr Jo Howard-Mccombe[2,3], Dr Helen Taylor[1], Dr Keri Langridge[4]
[1]Royal Zoological Society of Scotland, Edinburgh, United Kingdom, [2]RZSS WildGenes, Royal Zoological Society of Scotland, United Kingdom, [3]University of Bristol, , United Kingdom, [4]Saving Wildcats Partnership, Royal Zoological Society of Scotland, United Kingdom

Biography:
Helen Senn manages the Royal Zoological Society of Scotland's conservation department. This involves overseeing a range of active conservation translocation projects, including the Saving Wildcats Partnership, and the work of the RZSS WildGenes lab. Her academic background is in conservation genetics.

Conservation translocations can have many objectives. These must be carefully balanced by practitioners to produce an optimum management strategy. A primary genetic goal of conservation translocations should be to maximise genetic diversity. This is to ensure that a population has the best chance of persistence, not just over the coming decades, but centuries. Maximising genetic diversity will give a population the best chance of long-term resilience and adaptability, whether this allows it to adapt to a new life in the wild or withstand emergent diseases, climate change, ecological disruption, or other challenges.
If hybridisation is a threat, then its management against the backdrop of maximising genetic diversity provides a unique set of challenges and tensions.
Using over a decade of genetic data, gathered in support of Scottish wildcat, Sahelian antelope and Siamese crocodile conservation translocations, and data from model systems like red-sika deer hybridisation in Scotland, I will:

1. Outline how genetic technology has made great advancements in our measurement and real-time management of hybridisation and how genetic technology should (and should not) be used to manage hybridisation in a translocation context.
2. Explain why even with access to objective genetic data, we generally end up at a subjective set of decisions. What frameworks can practitioners use to guide these?

Living Fast on the Texas Prairies: Overcoming stochasticity to establish populations of an endangered prairie grouse

Paul Senner[1], Lena Larsson[2], Michael Morrow[3], James Mueller[3], Kelly Pardy[4], Aaron Pratt[2], Dr Lisa Faust[1]
[1]Alexander Center for Applied Population Biology, Lincoln Park Zoo, Chicago,, United States, [2]G.M. Sutton Avian Research Center, Bartlesville,, United States, [3] U.S. Fish and Wildlife Service, Marble Falls,, United States, [4]Houston Zoo, Houston,, United States

Biography:
As a member of the Alexander Center for Applied Population Biology at Lincoln Park Zoo, Paul is a scientific advisor specializing in conservation programs that straddle the ex-situ/in-situ boundary. Paul grew up in Anchorage, Alaska, and has worked on conservation programs from the Mekong Delta to the Midwest U.S.

The Attwater's greater prairie-chicken (APC; Tympanuchus cupido attwateri) is a U.S. Endangered Species native to coastal Texas and Louisiana. Land use change, invasive species and extreme weather all contributed to this species' decline, and in 1992 partner agencies initiated an ex-situ breeding program. Birds have been released annually since 1995 but, despite these efforts, populations remain below recovery targets. APC have high reproductive rates and naturally high mortality rates, which pose a dual challenge to species managers: how to manage an ex-situ population within the limits of available space, and establish a "stable" in-situ population of a fast living species. Using studbook data, data from wild radio-marked individuals and expert opinion we estimated model parameters and conducted a population viability analysis to assess the viability of both in-situ and ex-situ APC populations. In a meta-population model framework, we compared the impacts of disease, release strategy, hurricanes, land management and predator mitigation efforts on APC populations. Results suggest that the ex-situ population will remain demographically stable over the next 50 years and can continue to support release efforts, but will lose more than 10% of its genetic diversity at its current size. Based on estimated demographic rates, in-situ populations have a high probability of extinction within the next 10 years without continued releases. Management efforts aimed at increasing brood survival may be critical to program success. This work highlights the value of PVA in testing the efficacy of potential management actions in a dynamic system.

Optimizing responsible translocations of displaced organisms

Mr Vivek Menon[1], **Ms Julie Sherman**
[1]Wildlife Trust of India, Noida, India

Biography:
Julie has been leading conservation projects for more than 25 years. She is the Director of Wildlife Impact, a nonprofit advancing wildlife conservation through research, impact evaluation, and capacity development. Current projects include researching orangutan translocation impacts, facilitating human-orangutan coexistence, gorilla translocation planning, and developing guidelines for displaced wildlife translocation.

Authors: Vivek M., Julie S., Tony K., Richard K., Sonja L., Ashraf NVK, Pritpal S., Axel M.
Organisms are displaced in large numbers by anthropogenic and natural phenomena, leading to frequent uncertainty as to release options. Individuals may be held for short or long periods and guidance is needed to help for action that maximizes positive outcomes for individual organisms and affected populations. Irresponsible translocations have had devastating impacts on native wildlife and ecosystems, but displaced organisms can also have marked conservation potential. Suitable, healthy individuals released through well-planned and monitored conservation translocation programs with carefully managed risks can benefit taxon and ecosystem conservation. Displaced organisms can be particularly valuable when the capture/collection of wild individuals to support captive breeding/propagation programs is limited. Organisms can also be responsibly translocated for cultural purposes, returning healthy individuals to their home range, mitigating human-wildlife conflict, or improving individual welfare. Responsible translocations follow the precautionary principle to pose minimal risks to wild conspecifics, other wildlife, ecosystems, domesticated animals, and humans. They rely on pre-release studies identifying suitable habitat, risks to ecosystems and humans, and prioritize post-release monitoring. Responsible translocations maximize welfare for suitably rehabilitated individuals that have undergone appropriate health screening (animals), or phytosanitary and viability screening (flora). To address these opportunities, the IUCN Conservation Translocation Specialist Group and collaborators present new best practice guidance for translocations of displaced organisms. These complement existing IUCN guidelines, provide a process to optimize translocations, and note alternatives when responsible translocations are not feasible.

Applying best practice to feasibility assessment and strategic planning for reinforcement of a Grauer's gorilla population

Ms Julie Sherman[1], Prof Elizabeth A Williamson[2], Dr Kay H Farmer[1], Dr Katie Fawcett[3], **Mr Jackson Kabuyaya Mbeke**[3], Prof Damian Caillaud[4], Mr Benoit Ishaba[5], Dr Linda Parker[5], Ms Mary H Brown[6], Mr Dirck Byler[6]
[1]Wildlife Impact, Portland, United States, [2]University of Stirling, UK, [3]Gorilla Rehabilitation and Conservation Education (GRACE) Center, DRC, [4]University of California Davis, USA, [5]Virunga National Park, , DRC, [6]Re:wild, USA

Biography:
Julie worked with gorilla ecology, welfare, and rehabilitation specialists and the GRACE team to assess feasibility and develop methodology for a Grauer's gorilla translocation. [note: talk will be co-presented with GRACE Director Jackson Mbeke if he can attend. Jackson has studied gorillas since 2003, and leads the GRACE DRC center.

This presentation outlines practical application and outcomes of feasibility and risk assessments using the precautionary principle for conservation translocation of great apes. We considered the risks and benefits of translocating Critically Endangered Grauer's gorillas (Gorilla beringei

graueri) to different sites in eastern Democratic Republic of Congo, using IUCN guidelines, published studies on methodology and impacts of conservation translocations, and species- and habitat-specific data. The outcome was that one release site in the subspecies geographic range is compatible with IUCN criteria. Mt. Tshiaberimu is actively protected against poaching of wildlife and encroachment of the habitat, no sympatric great ape taxa are present and, most importantly, the resident Grauer's gorilla population is non-viable. To assess the suitability of this area as a release site, issues that must be evaluated include whether the resident gorillas and other wildlife would be negatively impacted by a translocation, carrying capacity of the habitat, existing threats, the needs of local human communities and their attitudes towards the park. Although lacking some of the information required, we sourced sufficient data to answer important questions regarding the risks and benefits of supplementing the gorilla population. Research by the translocation partnership (Gorilla Rehabilitation and Conservation Education (GRACE) Centre, Virunga National Park and Re:wild) is now underway to address key knowledge gaps. Our approach could encourage improved compliance with IUCN best practice guidelines for assessing potential release sites and planning translocations in cases where data are limited and risks to released great apes, wild conspecifics, and sympatric species are high.

Effects of Heterospecific Competitor Experience on Translocation Success of the Endangered Pacific Pocket Mouse

Dr Debra Shier[1,2], Janine Fischer[2], Ms. Shauna King[1], Dr. Alison Greggor[1], Dr. Greg Grether[2]
[1]San Diego Zoo Wildlife Alliance, Escondido, United States, [2]Department of Ecology and Evolutionary Biology, University of California, Los Angeles, Los Angeles, United States

Biography:
Dr. Debra Shier is the Brown Endowed Associate Director of Recovery Ecology at the San Diego Zoo Wildlife Alliance. She runs a growing program focused on threatened and endangered mammals and frogs in the Southwest. For over 25 years she has been studying the ways in which an understanding of animal behavior and ecology can be applied to conservation strategies such as reintroductions and translocations. In general, her research has focused on using basic theory to create effective and efficient relocation methods by encouraging settlement, dampening stress, and increasing fitness with an emphasis on behavioral competency. Her research collaboration with our Genetics division includes landscape level genetics to inform reserve management practices and species recovery. More recently, her research has expanded into local restoration and examining anthropogenic effects on wildlife behavior, fitness and persistence.

All species in a community interact, and understanding the ecological interactions between the target species and members of the receiver community is thought to be important for successful translocation. It's increasingly common for practitioners to consider how the target species will interact with predators that are present at the receiver site and to mitigate depredation through predator removal or to incorporate predator training into pre-release preparation procedures. But, to our knowledge, no study has evaluated the efficacy of heterospecific competitor experience. The Pacific pocket mouse (Perognathus longimembris pacificus) is one of the most critically endangered mammals in southern California, USA with just three small, isolated populations known to remain extant. P. l. pacificus lives in a community where multiple species of native rodents have overlapping diets. It is the smallest species in the guild and is behaviorally subordinate to the larger species present at receiver sites. Repeated aggressive interactions from resident heterospecific competitors could prevent translocated pocket mice from establishing burrows during the critical settlement period and reduce fitness. Direct removal of competitors is conducted to allow the species to become established, but is not a viable strategy to facilitate community integration and long-term persistence. We tested whether giving captive-born mice pre-release experience with a heterospecific competitor would modify their behavior and

improve translocation outcomes. Our results indicate that mice trained with a heterospecific competitor are more likely to survive than those that did not receive training. These results highlight the important of considering interspecific interactions during translocation.

Nation-wide identification and conservation of potential refugee species

Ms Kiarrah Smith[1], Dr Jennifer Pierson[2,3], Dr Maldwyn J. Evans[1], Dr Iain Gordon[4,5,6,7], Prof Adrian D. Manning[1]
[1]Fenner School of Environment and Society, Australian National University, Acton, Australia, [2]Australian Wildlife Conservancy, Subiaco East, Australia, [3]Centre for Conservation Ecology and Genomics, Institute for Applied Ecology, University of Canberra, Canberra, Australia, [4]The James Hutton Institute, Invergowrie, United Kingdom, [5]Central Queensland University, Townsville, Australia, [6]Land and Water, CSIRO, Townsville, Australia, [7]Protected Places Mission, National Environmental Science Program, Reef and Rainforest Research Centre, Cairns, Australia

Biography:
Kiarrah grew up in Dubbo and completed her undergrad through UNE, did her Honours on the ash-grey mouse at Murdoch University, and worked as a fauna ecologist in the Blue Mountains before embarking on her PhD. Her current research is part of the Mulligans Flat-Goorooyarroo Woodland Experiment in the ACT.

A species is expected to be most resilient to future environmental change when it occurs across a broad diversity of ecosystem types. However, despite increasing recognition of the importance of prehistoric records, it remains easy to overlook the fact that many species once occupied a broader range, or greater diversity of ecosystem types, than is indicated by their current distribution. Such oversights hinder the adaptive capacity and effective conservation of species that have become restricted to a subset of formerly-occupied ecosystem types. In a study of all native rodent species in Australia (a group that has suffered several extinctions and notable declines), we interpret patterns in extents inferred from the overlay of bioregions, occurrence records (including subfossils), and current distributions as a measure of the shifting baseline syndrome described above. We propose that this measure could aid the identification and prioritisation of actions for "potential refugee species" (i.e., species suspected of being restricted to a realised niche that is suboptimal for individual fitness). The potential refugee status is different from, but complementary to, a species' IUCN Red List status. Incorporating national vegetation mapping into the inferred extents, a broad scope for potential restoration opportunities can be derived to aid conservation efforts. Ultimately, our aim is to encourage and facilitate the undertaking of a diversity of translocations so that species' adaptations to a broad range of ecosystem types (including climates) can resume.

Characterising immune gene diversity to improve disease outcomes for one of the world's rarest shorebirds

Ms Olivia Janes[1], Ms Molly Magid[1], Ms Ilina Cubrinovska[1], Dr Jana Wold[1], Prof Brett Gartrell[2], Mr Dave Houston[3], **Professor Tammy Steeves**[1]
[1]University Of Canterbury, Christchurch, New Zealand, [2]Massey University, Palmerston North, New Zealand, [3]Department of Conservation, Auckland, New Zealand

Biography:
Tammy co-leads the Conservation, Systematics and Evolution Research Team (ConSERT). In partnership with relevant tribes (imi and iwi) and subtribes (hapū), conservation practitioners and local communities, her team combines genomic and non-genomic data using innovative approaches

to co-develop conservation translocation strategies for some of Aotearoa New Zealand's rarest species.

Conservation translocation breeding programmes often rely on neutral diversity as a measure of genetic 'health'. However, incorporation of functional diversity, such as immune gene diversity, may better inform management decisions. Endemic to Aotearoa New Zealand, the Endangered tchūriwat' | tūturuatu | shore plover (Thinornis novaeseelandiae) is a species whose recovery may be hampered by a lack of immune gene diversity. Unlike birds in the wild, captive birds are highly susceptible to avian pox infections and show poor immune response to vaccination. Our previous research showed that, despite low toll-like receptor (TLR) gene diversity overall, wild and captive tchūriwat' form two distinct genetic clusters. TLRs are a key part of recognition and activation pathways in the immune system. Here, we extend this research to characterise TLR gene diversity in relation to avian pox severity in the captive population before and after augmentation with birds from the wild. In addition to informing future augmentation strategies to improve disease outcomes for tchūriwat', our approach for characterising TLR gene diversity is broadly applicable to conservation translocation breeding programmes for threatened birds in Aotearoa New Zealand and beyond.

A review of mammalian carnivore translocations – prey impacts, ecosystem effects, and a case study in arid Australia

Mr Ben Stepkovitch[1], Associate Professor Katherine Moseby[1], Professor Richard Kingsford[1]
[1]Centre for Ecosystem Science, UNSW, Botany, Australia

Biography:
I was fortunate enough to be an intern at Arid Recovery during the 2018 western quoll reintroduction. I have now come back as a PhD candidate with UNSW to study the impacts quolls have had on the reserve. I am also a tour guide at Taronga Zoo, Sydney.

Carnivore reintroductions are assumed to provide numerous ecological benefits, including conservation of the reintroduced carnivores, regulation of prey species and restoration of ecosystems. Reviews of mammalian carnivore reintroductions and resultant ecosystem effects have focused on large carnivores. We reviewed global terrestrial carnivore reintroductions across all taxa including taxonomic bias, prey impacts and their ecosystem effects. We obtained data from 536 conservation translocations across 54 species of terrestrial mammalian carnivore species (Order Carnivora and Family Dasyuridae). A third of all conservation translocations occurred in South Africa and a third within fenced reserves. Small carnivore conservation translocations were generally under-represented compared to large carnivores. Effects on resident prey species or ecosystems from carnivore conservation translocations were rarely investigated. Challenges to ongoing translocations of mammalian carnivores include perceived threats to resident threatened prey species and difficulties in monitoring the ecological effects of carnivore reintroduction. Poor post-release monitoring and a lack of empirical studies remains a persistent problem, contributing to the poor understanding of ecosystem effects following carnivore reintroductions. In addition, we provide a case study into the investigation of prey impacts and ecosystem effects following the reintroduction of a native predator, the western quoll (Dasyurus geoffroii), to a fenced reserve in South Australia. We present an overview of results of investigating prey behaviour changes, trophic cascades and prey impacts after this carnivore reintroduction. As predator reintroduction programs become more common, measuring the dynamic impacts on prey populations and ecosystem effects is increasingly important and our work provides a detailed novel case study.

Soft-release or hard-release? Implications for movement and survival of Plains Mouse reintroduced to the Pilliga forest NSW

Dr Vicki Stokes[1], Dr Greg Holland[1], Ms Zoi Banikos[1], Ms Caitlin Potts[1]
[1]Australian Wildlife Conservancy, Narrabri, Australia

Biography:
Dr Vicki Stokes is a Senior Wildlife Ecologist with Australian Wildlife Conservancy working on a large reintroduction project in the Pilliga forest, NSW. This project is a partnership with the NSW Government and aims to reintroduce six regionally extinct species into a feral predator-free conservation fence.

The release of animals into small, temporary enclosures ("soft-release") may assist with acclimation following translocation, potentially reducing post-release dispersal and increasing survival. However, the effectiveness of soft-release methods varies and has not been adequately tested for rodents.
In June 2023, Plains Mice will be reintroduced to a 5,800 ha feral predator-free fenced area in the Pilliga forest NSW following captive breeding. Given that individuals may disperse widely, suffer high mortality rates and be able to pass through the conservation fence, anchoring animals to suitable habitat and providing supplementary resources may be critical for survival and population establishment.
Upon translocation, we aim to test the efficacy of soft-release approaches in limiting movements of Plains Mice and increasing survival. A total of 20 Plains Mice will be released initially into four 0.01 ha soft-release pens (5 animals per pen) with food, water and shelter provided. Pens will be opened after 2 weeks and food, water and shelter maintained inside the pens for another 2 weeks. Another 20 Plains Mice will be released into adjacent and similar habitat outside of the pens. Movement and survival of the 40 individuals will be assessed using telemetry.
Results from this work will provide quantitative evidence of the utility of soft-release methods for rodent translocations and will inform future translocations of small mammals.

Post-release monitoring of dispersal to improve reintroduction outcomes

Dr Zoe Stone[1], Dr Kevin Parker[2], Ms Kara Macdermid[1], Professor Doug Armstrong[1]
[1]Massey University, Palmerston North, New Zealand, [2]Parker Conservation, Nelson, New Zealand

Biography:
Zoë Stone is a post-doctoral fellow at Massey University. Her research focuses on how effective monitoring can help guide management and improve reintroduction outcomes. She has been involved in a range of threatened bird programmes and reintroductions in Aotearoa & Australia

Reintroductions to large, connected, unfenced sites generally have a high failure rate. Dispersal is likely a key factor, with vulnerable species moving beyond the protection of managed areas. However, adequate resources for monitoring, and the difficulties associated with tracking small, mobile species means there is poor understanding around post-release dispersal and habitat selection. We undertook a reintroduction of toutouwai/North Island robins (Petroica longipes) into a large, connected forest site in Turitea Reserve. We monitored toutouwai for 11 weeks following translocation using radio-telemetry, drones and call playback to determine site fidelity and territory establishment. Touotuwai had a higher site fidelity than predicted based on analysis of previous translocations, with 20 of the 40 birds known to be alive and remaining within the 2000-ha reserve boundary at the start of the next breeding season. Habitat selection during dispersal and territory establishment phases followed similar patterns. However, birds had an increased preference for areas with increased soil moisture and a taller canopy. Distance

from the release site was also more important when determining territory location compared to dispersal. Toutouwai dispersed across 1116 ha of the reserve and travelled up to 7 km during initial exploration. However, they contracted to settle within 300 ha of core habitat with all final territories within 900 m of the release location. Monitoring is a critical component of reintroductions, and effective monitoring can help identify patterns of dispersal and establishment that may influence long-term persistence and enable adaptive management practises to improve reintroduction outcomes.

Challenges for assisted gene flow between established populations of eastern barred bandicoots

Dr Duncan Sutherland[1,2], Mr Henry Petch[2], Prof Ben Phillips[2], Prof Ary Hoffmann[2], Dr Andrew Weeks[2,3]
[1]Phillip Island Nature Parks, Cowes, Australia, [2]The University of Melbourne, Parkville, Australia, [3]Cesar Australia, Brunswick, Australia

Biography:
Dr Duncan Sutherland is the Deputy Research Director at the Phillip Island Nature Parks, a Research Fellow at the University of Melbourne and Chair of the Eastern Barred Bandicoot National Recovery Team. His research focus on restoring island ecosystem functions, managing pest animals, conserving seabird populations, and protecting threatened species.

The mainland eastern barred bandicoot, Peremeles gunnii, is a threatened marsupial in south-eastern Australia which in 2021 was reclassified from 'Extinct in the Wild' to 'Endangered'. The recovery was enabled by a successful captive breeding program and subsequent translocations from captivity back to the wild. Learnings from both failed and successful reintroductions revealed fox predation was a critical determinant of failure. As such, subsequent translocations have been restricted to safe-haven locations, including assisted colonisations to three fox-free islands and four predator-proof fenced reserves.
Despite the numerical recovery, genetic diversity within all populations is low and in decline since 1990. To halt the decline in genetic diversity, all populations are now managed as a single metapopulation, which relies on translocating individuals between established sites. However, the success rate of these translocations is unknown.
In October 2021 five male hybrids of mainland and Tasmanian subspecies of eastern barred bandicoots were released into an established and dense population on Churchill Island and for the first time their survival and genetic contribution could be monitored through live-trapping and tracking their unique Tasmanian alleles. Despite reasonable power to detect genetic introgression, trapping in 2022 and 2023 has so far failed to capture these migrants, nor any potential offspring. This suggests that despite expectations, the migrants failed to either establish or contribute genetically to the population. Alternative strategies are likely to be required to maximise translocation success into established populations and allow gene flow.

The forgotten masses: a call for focused innovation efforts to improve invertebrate translocation outcomes

Dr Helen Taylor[1], Mr Carl Allott[1], Mr Adam Button[1], Ms Katarzyna Ruta[1], Dr Helen Senn[1]
[1]Royal Zoological Society of Scotland, Edinburgh, United Kingdom

Biography:
Helen Taylor currently manages three invertebrate translocation programmes at RZSS and onsite biodiversity conservation. She managed the wild-to-wild beaver translocations for the Scottish

Beaver reinforcement between 2018 and 2020. Prior to working at RZSS, Helen spent eight years in New Zealand working on conservation genetics and translocations in native birds.

Invertebrates are in crisis, and we need innovative solutions to assist those working on invertebrate conservation translocations. Unfortunately, our review of the IUCN Global Conservation Translocation Perspectives (GCTP) series shows that, of the 421 case studies recorded between 2008 and 2021, only 8% feature invertebrates. Within these, only four of the 32 recognised invertebrate phyla are represented, with the majority of translocation efforts (63%) focused on insects. Two orders, Orthoptera and Lepidoptera, account for more than half of all invertebrate translocation case studies, leaving the vast majority of invertebrates neglected by translocation science and practice.

The Royal Zoological Society of Scotland conservation department currently runs invertebrate breeding for translocation programmes for two insect and one snail species. Over the past five years, we have gathered a wealth of experience and data on these species, and invertebrate conservation translocations in general. Here, we combine this knowledge with a review of the challenges faced by the invertebrate case studies in the ICUN GCTP series to demonstrate that the major issues facing invertebrate translocation programmes are: a lack of life history data; a lack of veterinary expertise in invertebrate disease; the often short and multistage lives of many invertebrate species; the challenges of post-release monitoring and forming exit strategies for many invertebrate taxa; and the lack of funding for invertebrate work. We suggest that increasing the number of invertebrate translocation programmes would itself be an innovation, and highlight other potential methodological innovations to improve outcomes for some of our most crucial ecosystem players.

Do the hydro/thermal properties of animals at the source location persist at at the translocation site?

Ms Dee Trewartha[1], Professor Mike Gardner[1]
[1]Flinders University, Bedford Park, Australia

Biography:
Throughout my personal and professional life, I have strived to find ways to minimise human impacts on biodiversity and conservation of our Australian flora and fauna. This has led to field-based research with pygmy bluetongue conservation projects and my PhD on thermal-hydro properties of animals at source and translocation sites.

For many reptilian species, translocation remains the most viable climate change mitigation despite historical low success rates. Behavioural plasticity at the population/lineage level may be key to persistence under translocation. Using the endangerd pygmy bluetongue, a spider burrow dwelling grassland species endemic to South Australia as the study species, we aimed to determine the presence/absence of wild lizard lineage differences in behavioural response to temperature and relative humidity measured at the microclimate level and whether differences persisted at the translocation site. We found persistent lineage differences were found in with both behavioural measures. The two lineages showed marked differences in surface activity levels and responded opposingly to base-of-burrow humidity in the approach distance measure. Lineages varied in activity-temperature and activity-humidity ranges across the wild and translocation sites. Our results imply populations may vary in their hydro/thermal priorities and these differences should be taken into account during translocations.

Climate impacts and adaptive strategies for translocated populations: an arid perspective

Dr Katherine Tuft[1], Dr Genevieve Hayes[1], Associate Professor Katherine Moseby[2]
[1]Arid Recovery, Roxby Downs, Australia, [2]University of New South Wales, Sydney, Australia

Biography:
Kath is a conservation scientist and manager of conservation research organisation Arid Recovery. Her expertise is in integrating research and monitoring with management actions. She draws on experience from across Australia in threatened species recovery, national parks and the conservation NGO sector.

Climate change puts conservation translocation programs at increasing risk of failure. Translocation sites formerly suitable for some species may shift to conditions outside a species' physiological tolerances. Climate stress will impact habitat components that translocated species depend upon. More frequent and intense extreme events (fires, droughts, floods) can have catastrophic impacts on small, fragmented or confined populations, and these stressors threaten the genetic diversity of translocated populations.

In arid South Australia, the average temperature has already risen by 1.5 degrees, heatwaves are becoming longer and more intense, and rainfall patterns are shifting. We are measuring these impacts at Arid Recovery, a 12,300 ha predator-proof fenced reserve. Extended drought conditions caused dramatic crashes in populations of threatened species, death of long-lived vegetation and the functional extinction of one reintroduced species.

A key challenge for translocated species in predator-free reserves is that they are confined within fences or on islands and cannot disperse to, or repopulate from, climate refugia. We therefore developed a range of measures to mimic refugia by installing soakage areas, providing supplementary water and food, and being prepared to translocate animals for ex situ protection. Thresholds guided these actions and allowed for increasingly interventionist strategies as populations declined.

We are now applying the most effective adaptive strategies and promoting resilience in the ecosystem by managing grazing and waterflow. Research is underway to test tolerances of different species to extremes. We are also planning for growing strain on critical fencing infrastructure affected by sand movement and storm damage.

Conservation translocations of bioturbators for ecosystem change

Dr Leonie Valentine[1,2], Miss Bryony Palmer[2,3], Dr Gabrielle Beca[2,3], Dr Anna Hopkins[4], Dr Katinka Ruthrof[5]
[1]WWF-Australia, Sydney, Australia, [2]University of Western Australia, Perth, Australia, [3]Australian Wildlife Conservancy, Perth, Australia, [4]Edith Cowan University, Joondalup, Australia, [5]Murdoch University, Murdoch, Australia

Biography:
Leonie Valentine is a conservation scientist who has worked extensively on many of Australia's critters – examining the responses of wildlife to disturbances and the role of wildlife in ecosystem function and restoration ecology. She currently works with the Species Conservation team for WWF-Australia.

Many of the world's threatened species are considered ecosystem engineers due to the functional role they provide in landscapes, and the decline or loss of these species may have repercussions for ecological processes. Consequently, a natural assumption is that reintroductions of keystone species may assist in restoring ecosystem processes. Digging animals (bioturbators) are increasingly recognised as important contributors to nutrient cycling, soil health and vegetation composition, as they substantially disrupt and modify the ground's surface by creating foraging pits and burrows or by movement through soil. We reviewed the conservation status of the world's digging mammals and determined that nearly a quarter (22%) of the >3930 non-flying land-dwelling mammals can be considered bioturbators. Of this critical ecological group, 16% of species are threatened. Oceania – especially Australia – is the continent with the highest proportion of threatened (27%) and Extinct (11%) bioturbator mammals. Many of Australia's threatened digging mammals, have been the focus of reintroduction programs, with at least 208 translocations of 24 species recorded, though few translocations have assessed the subsequent ecosystem impacts (or lack thereof). We synthesise how translocations of Australian digging mammals, especially bandicoots and bettongs, can influence ecosystem processes – including reducing fuel loads, soil nutrient availability, fungal and plant dispersal and recruitment, and potentially soil-carbon storage – and make recommendations for ecosystem monitoring when translocating digging mammals. We also explore how upscaling translocations of bioturbators could lead to ecosystem change.

Adaptive Management Approach To Save A Critically Endangered Bird: The Case of the Regent Honeyeater (Anthochaera Phrygia) Breeding Program

Dr Monique Van Sluys[1], Dr Joy Tripovich, Ms Emily Schmelitschek, Dr Benjamin Pitcher, Mr Andrew Elphinstone
[1]Taronga Conservation Society Australia, Mosman, Australia

Biography:
With a background in Ecology, Monique is especially interested in understanding ecological processes and how this understanding can be applied to conserving biodiversity. Monique is responsible for planning and coordinating the breeding program for the critically endangered Regent Honeyeater.

The Regent Honeyeater is a critically endangered native Australian songbird with fewer than 300 adult birds remaining in the wild. The breed for release program aims to bolster the wild population with zoo-bred birds until the wild population becomes self-sustaining. Since its inception in 1995, when the first nine wild birds were collected, there has been over 400 birds released to the wild. Evidenced based research has provided information on the impacts of zoo-life experience on the post-release survivorship and breeding success in Regent Honeyeaters. For example, time spent in large, complex, multispecies aviaries has been shown to be important for post-release survival. These findings have enabled the optimisation of the management strategies for the breeding population, the design of facilities, as well as the selection of release cohorts. There has also been extensive research into tutoring of Regent Honeyeaters to sing the wild-type song. This is important as song is intrinsically linked to courtship and breeding and there is the expectation that birds that sing the same song as their wild counterparts, will have improved post-release success. Moreover, recent Population Viability Analysis modelling has emphasized the need for an increase in the number of zoo-bred birds as a key strategy to avoid extinction within the next 20 years. Therefore, the ability to have an iterative process to implement changes as new information becomes available, has been critical to the management strategy of the breed for release program for this species.

What can a historian say about a global history of reintroductions?

Dr Monica Vasile[1]
[1]Maastricht University, Maastricht, Netherlands

Biography:
Monica Vasile is an environmental historian based at Maastricht University in the project 'Moving Animals: A history of Science, Media and Policy in the 20th century'. Her research looks at the global history of reintroductions, exploring practices of conservation and the production of science aimed at rescuing species from extinction.

This presentation will explore what a historian can offer to a history of reintroductions. While wildlife and conservation have not necessarily been a focus for conventional history work, in recent years fields such as environmental history and animal history have flourished. In this talk, I will look at methods and practices of research and writing that are common to historians and can be applied to conservation science and practice. I will reflect on what constitutes archival material and how contextualization matters. Moreover, I will discuss concepts that animal historians work with, such as animal agency. My presentation will draw on examples from three case studies of historical research: the Przewalski's horse, the Vancouver Island marmot and New Zealand's takahe rail.

Can we define a science-driven health monitoring protocol for conservation translocations? Lessons from eastern black rhinos in Kenya

Dr Francesca Vitali[1], Dr James Hassell[1], Dr Suzan Murray[1], Dr Mathew Mutinda[2], Dr Edward Kariuki[2], Dr Dawn Zimmerman[5], Dr Friederike Pohlin[4], Mr Cedric Khayale[3]
[1]Smithsonian Institution - Global Health Program, Washington, United States, [2]Kenya Wildlife Service - Veterinary Department, Nairobi, Kenya, [3]Wildlife Research and Training Institute, Naivasha, Kenya, [4]VetMedUni - Research Institute of Wildlife Ecology, Vienna, Austria, [5]Veterinary Initiative for Endangered Wildlife, Bozeman, United States

Biography:
Francesca Vitali is a veterinarian and researcher at Smithsonian's Global Health Program. Vitali holds a PhD in wildlife anesthesiology, and recently completed her postdoctoral project sponsored by Morris Animal Foundation. Her research, supported by National Geographic Society, focuses on improving the health during translocations of eastern black rhinos in Kenya.

Despite recognition of the health risks posed by translocations - mainly due to stress-related complications and disease transmission - health monitoring is rarely conducted due to lack of resources such as field-friendly reporting systems, and of scientific evidence for the long-term health impacts of translocations. This is particularly problematic amid a sixth mass extinction where translocations are required to support species and ecosystems resilience. A holistic study on the health impacts of translocations on eastern black rhino (EBR - a species that relies its survival on translocations) is being used as a proof-of-concept to develop an interdisciplinary approach to monitoring the deleterious outcomes of translocations and demonstrate their direct conservation benefits on species survival and population growth. The study is being conducted by an interdisciplinary team of veterinarians, biologists and ecologists and involves all translocation phases (from candidate selection to long-term monitoring) focusing on 1) improving anesthetic and transport safety; 2) defining strategies to prevent acute and chronic stress and their health consequences using non-invasive endocrinology and behavioural

monitoring by rangers; 3) assessing translocation disease risk linked to stress levels; and 4) establishing translocation risk factors and candidate selection criteria. The study is also being used to pilot a platform for field-friendly health monitoring and real-time reporting system of translocation health outcomes within the EarthRanger system. Preliminary results suggest that integrating standardized health monitoring approaches into translocation planning generates knowledge for building best-practice translocation guidelines, enables early detection of morbidity to prevent failure, and generates data to evaluate conservation outcomes.

Is it time for assisted colonisation of the critically endangered Leadbeater's possum given risks posed by bushfire and climate change?

Mr Darcy Watchorn[1], Dr Dan Harley, Ms Arabella Eyre
[1]Zoos Victoria, Como, Australia

Biography:
Darcy Watchorn is an early career conservation biologist working with threatened arboreal and terrestrial mammas in Australia. He works at Zoos Victoria as a Translocation Biologist, where he focuses primarily on the critically endangered Leadbeater's possum. Darcy is also completing his PhD at Deakin University.

The highland Leadbeater's possum, a critically endangered cold-adapted species restricted to a small area of forest in south-eastern Australia, is at risk of extinction due to bushfire, native forest logging, and climate change. Recent captive-breeding efforts have proven challenging, and there are few in situ management options available to mitigate the increasingly severe impacts of climate change and bushfire. Assisted colonisation to expand the area of occupancy may provide the best avenue to spread the risk posed by these threats and reduce extinction probability.
We undertook expert elicitation to examine the likelihood of ≥500 individuals remaining in the wild in 50 years under three management scenarios (1) conservation action within the species' current range to address short-term threats (i.e. provision of artificial dens to address current tree hollow shortages), (2) establish a satellite insurance population to reduce the risk of fire- and climate-driven extinction in the medium- to long-term, and (3) a combination of these. Multiple release regions within Victoria were compared, with varying combinations of carrying capacity, fire risk, future climate suitability, and alignment with the species' historic range. The best population outcomes were estimated to occur when applying both den provisioning in the species' current range and establishing a satellite insurance population in two distinct regions. Assisted colonisation of Leadbeater's possum has political risk, whereby it could be used as an argument to continue logging within the species' current range; a potentially perverse outcome that must be avoided.

Observing a changing world from space: Remote sensing for the European Northern Bald Ibis reintroduction project

Ms Helena Wehner[1], Dr Johannes Fritz[1], Dr. Miguel Quevedo Munoz[2]
[1]Waldrappteam Conservation & Research, Mutters, Austria, [2]Zoobotánico Jerez, Jerez de la Frontera, Cádiz

Biography:
Helena studied geography and is continuing her education with a master's degree in earth observation at the University of Würzburg. She is involved in research on remote sensing and geoinformation for applied conservation. Since 2019 she also works as a foster parent in the European Northern Bald Ibises project.

Continuous monitoring of earth from space is a well-established method to record the changing environment. These data and the models based on them are becoming an increasingly important basis for planning and monitoring of wildlife translocation and conservation measures. In particular, it supplements the use of biologging devices, as widely used method for monitoring of animals.
The European LIFE-project for the reintroduction of the endangered Northern Bald Ibis (Geronticus eremita) is using remote sensing data in the context of a translocation. To set up a species distribution model along the entire northern foothills of the Alps, indices describing environmental conditions were calculated from satellite images of Landsat-8 and Sentinel-1. A random forest model with 84.5% overall accuracy was fitted on NBI GPS positions, used to identify regions with high predicted foraging suitability for further translocation measures. Currently, this release population is increasingly threatened in its migration behaviour by climate change. These effects should be mitigated by a collaboration with the Spanish „Proyecto Eremita". A fusion of our migratory and their sedentary release population aims at providing both populations with greater ecological flexibility. In this context, it is essential to identify suitable habitats and to record environmental changes in a pan-European perspective by use of satellite-based earth observation data.
Our project is thus exemplary for an interdisciplinary approach in which remote sensing data, supplemented by comprehensive GPS monitoring, form an essential basis to design a large-scale translocation project and to minimize the impact of climate change in the release population.

Implementing a range of release protocols to minimise risks of translocation failure

Dr Rebecca West[1], Dr Reece Pedler[1], Associate Professor Katherine Moseby[1]
[1]University of New South Wales, Sydney, Australia

Biography:
Rebecca is the principal ecologist for the Wild Deserts project, a project using translocation to achieve landscape scale restoration of an Australian arid ecosystem. She is an early career researcher with a focus on reintroduction and translocation ecology.

Initial translocations are inherently risky due to uncertainty about species-specific responses to novel environments and the ability to manage known and potential threats. Predator free environments remove predation risk but there are usually many other risks to translocation failure. Proactively identifying these risks and implementing a range of release protocols can improve translocation outcomes. We conducted initial translocations of two species to predator free environments and used radiotracking to test release protocols to increase translocation success. We identified post-translocation hyperdispersal as a risk to the first translocation of the crest-tailed mulgara (Dasycercus cristicauda), a carnivorous marsupial, and tested temporary confinement in pens and releasing females with pouch young. Temporary confinement did not influence survival of mulgara but did influence dispersal behaviour with 42% immediate release animals hyperdispersing compared to 29% temporary confinement animals. Releasing females with pouch young led to an accelerated increase in the translocated population from 9 to 58 individuals within 4 months. We identified availability of suitable nesting sites as a risk to the first translocation of greater stick-nest rat (Leporillus conditor) to our study site. These native rodents build elaborate permanent stick nests around perennial shrubs or under rocky overhangs that are passed on to successive generations. We tested the provision of artificial nest structures in assisting rats to establish nests by comparing the use of self-built nests with two artificial nest designs. Proactive identification of these risks and implementing release protocols under an experimental framework assisted with understanding their contribution to translocation success.

Translocating platypuses: challenges associated with performing a disease risk analysis for the world's most evolutionary distinct species

Dr Jess Whinfield[1,2], Professor Kristin Warren[1], Dr Larry Vogelnest[2], Dr Rebecca Vaughan-Higgins[1]
[1]Murdoch University, Murdoch, Australia, [2]Taronga Conservation Society Australia, Mosman, Australia

Biography:
Jess is a veterinarian completing a Conservation, Wildlife and Zoological Medicine Residency Program through Murdoch University, based at Taronga Zoo, Sydney. The Residency involves both clinical work and research, and her thesis is on platypus health and disease.

Platypus (Ornithorhynchus anatinus) populations are declining due to accelerating threatening processes including changing land use, river regulation, and climate change. With limited overland dispersal, the species is vulnerable to local extinctions that cumulatively impact overall population stability. Therefore, translocations may become an increasingly important tool for platypus conservation. A translocation of ten platypuses is scheduled for May 2023, with the objective of reintroducing platypuses to Sydney's Royal National Park. No formal disease risk analysis (DRA) had previously been performed for monotremes, and challenges were encountered in the DRA process. Firstly, despite their iconic status, our understanding of platypus health and disease is constrained by the practical challenges associated with researching a semi-nocturnal, semi-fossorial, and semi-aquatic species. These knowledge gaps were important to explore during the DRA process and were a key consideration when deciding to use animals from single or multiple source populations. Fortunately, fieldwork associated with the translocation has presented a unique opportunity for pathogen-focused sample collection. This facilitated a more nuanced understanding of pathogen variation between different platypus populations and highlighted the value of multi-disciplinary translocation teams to maximise outputs of labour- and resource-intensive fieldwork. Secondly, given unique, species-specific parasites have evolved alongside the evolutionarily distinct platypus, it was important to formally capture the intrinsic value of conserving these species alongside their more charismatic host. Overall, the DRA process highlighted the importance of using first principles and avoiding over-simplifying disease ecology in the absence of robust and nuanced data.

Personality and translocation success in a threatened rodent

Ms Kelly Williams-Kelly[1], Dr Laurence Berry[2], Ms Kim Branch[3], Dr Saul Cowen[3,4], Mr Sean Garretson[3], Dr Greg Holland[5], Dr Rachel Ladd[5], Dr Liberty Olds[6,7], Ms Kelly Rayner[3], Dr Colleen Sims[3], Dr Leanne Van Der Weyde[3], Dr Kylie Robert[1], Dr Kerry Fanson[1]
[1]La Trobe University, Melbourne, Australia, [2]Department of Energy, Environment and Climate Action, Victorian Government, Melbourne, Australia, [3]Department of Biodiversity, Conservation and Attractions, Western Australian Government, Woodvale, Australia, [4]School of Biological Sciences, University of Western Australia, Crawley, Australia, [5]Australian Wildlife Conservancy, Buronga, Australia, [6]Zoos South Australia, Adelaide, Australia, [7]Department of Environment and Water, South Australian Government, Adelaide, Australia

Biography:
Kelly researches the relationship between behavioural traits, endocrinology, and fitness. She collaborates with government agencies and not-for-profit organisations. She is part of two exciting

projects reintroducing a threatened mammal back to its historical range, and is hoping to apply her research findings to improve future conservation outcomes.

We know non-human animals exhibit consistent individual differences (personality) in both their physiological and behavioural responses, however, we are still discovering how individual traits influence fitness. In some species, exploratory and bold individuals have the greatest reproductive output but lower survival. Conservation translocations rely on individuals surviving and reproducing; consequently, personality can impact translocation success. In this study we investigated individual and population-level physiology, behaviour, and survival across three translocations of a threatened Australian rodent, the greater stick-nest rat (Leporillus conditor). Animals were sourced from the last naturally-occurring wild population (remnant-wild), a wild population reintroduced ~35 years ago (reintroduced -wild) and a captive-bred population. We used faecal glucocorticoid metabolites (FGMs) to measure stress physiology pre- and post-translocation. Individuals varied greatly in their physiological response post-translocation. At the population level, FGMs of the remnant-wild population did not change, while the reintroduced-wild population exhibited a significant decrease and the captive-bred population a significant increase. During capture and handling we scored the bold behaviours displayed by each individual. Behavioural consistency was assessed by comparing the scores of individuals caught more than once. Personality of captive-bred individuals was also measured in arena tests to quantify exploration (open field), boldness (novel object) and sociability (mirror). Behaviour varied between individuals and sex. Our next aim is to determine if source population, FGMs or behavioural traits are correlated with post-translocation survival. Our findings will improve future translocation outcomes by better understanding how personality and physiology influence survival and how individuals adapt following translocation.

The translocation continuum: a framework for context-specific decision-making

Mx Belinda Wilson[1], Dr Maldwyn J. Evans[1], Dr Iain Gordon[1,2,3,4,5,6], Prof Adrian D. Manning[1]
[1]The Australian National University, Acton, Australia, [2]Central Queensland University, Townsville, Australia, [3]James Hutton Institute, Craigiebuckler, Scotland, [4]CSIRO Land and Water, Townsville, Australia, [5]Reef and Rainforest Research Centre, Cairns, Australia, [6]Lincoln University, Lincoln, New Zealand

Biography:
Belinda Wilson works to develop the field of translocation science by exploring tactics, behaviour, movement, species recovery targets, and coexistence conservation through context-specific decision-making that accounts for uncertainty. She has contributed to translocation programs for eastern quolls (PhD), eastern bettongs, bush stone-curlews, and New Holland mice.

The recipe for building and executing a translocation program will change throughout its lifetime, and can never be a 'set and forget' affair. Not only do the goal posts need to move over time, but the ground on which a program is built is constantly shifting and revealing additional sources of uncertainty.

Here I present the 'Translocation Continuum' framework, which considers the uncertainty associated with a translocation program along a contextual continuum, and proposes criteria, primary strategies, recommended tactics, evaluation measures, and expected outcomes for five key translocation 'phases': (1) Feasibility Studies, (2) Pilot Studies, (3) Primary Trials, (4) Secondary Experiments, and (5) Tertiary Reinforcements. The framework aims to balance conservation and research strategies, and highlights the need to act both proactively in anticipating and mitigating threats, and reactively within an adaptive management framework.

I will discuss the confines of 'success' and 'failure' labels in translocation science, and the importance of parsimonious decision-making that balances objectives to maximise learning with the least amount of loss. Only by managing expectations of the likelihood of establishment, growth, and regulation throughout a program's lifetime can we galvanise trust and investment in translocations so they can contribute meaningfully to restoration in the long term.

By promoting parsimony and clarifying phase-appropriate goals and measures of success, the Translocation Continuum framework offers a multi-phased approach that practitioners can use to guide their decisions to resolve uncertainty and make several steps toward conservation goals.

Understanding the effectiveness of mitigation translocation for Columbia Spotted Frogs (Rana luteiventris) in British Columbia, Canada

Megan Winand[1], Prof Tara Martin[1], Dr Leigh Anne Isaac[2], Prof Scott Hinch[1]
[1]University of British Columbia, Vancouver, Canada, [2]Ministry of Water, Land and Resource Stewardship, Canada

Biography:
I am an MSc candidate in the Conservation Decisions Lab at the University of British Columbia, specializing in herpetofauna. I have gained experience in aquatic biology, conservation, and wildlife resource management through my work with various environmental organizations and government agencies.

Mitigation translocation is a commonly used practice in British Columbia (BC) to protect herpetofauna from the negative impacts of human-caused habitat alteration or destruction. However, despite its widespread use, the success rates of this approach remain uncertain, particularly when compared to other types of translocations. The Columbia Spotted Frog (Rana luteiventris) is notably impacted by mitigation translocation projects in BC, and serves as the focal point of this study. Using passive integrated transponder (PIT) tags and capture-mark-recapture methods over a two-year period, I will assess post-translocation survival of Columbia Spotted Frogs that have been moved to one of three treatments: 1) control, 2) a wetland that is a short distance (> 1km) away, and 3) a wetland that is a long distance (> 5km) away from the control. Radio transmitters will be assigned to a subset of Frogs in year 1 and tracked over 3 weeks to understand if movement patterns change post-translocation. Preliminary results from this study will be discussed. This study will fill knowledge gaps and provide valuable insights into improving the effectiveness of mitigation translocation for amphibians.

Showcasing the applicability and effectiveness of conservation genomic studies using our simple, standardised workflows

Dr Jia-yee Yap[1], Prof. Maurizio Rossetto[1]
[1]Royal Botanic Gardens and Domain Trust, Sydney, Australia

Biography:
I am a conservation genomics coordinator working with my team at the Royal Botanic Gardens Sydney on the conservation and restoration of Australian plant species. I am passionate about using genetics to assist with the conservation of plant species and particularly using genetics in a practical yet highly applicable manner. Most threatened plants in Australia are data deficient, and this lack of knowledge particularly on the key threatening processes contributing to species decline makes it impossible to prioritize suitable conservation management actions.

With lowered costs and increased efficiency, conservation genomics can provide valuable insights into biology and thus conservation management of threatened species.

Here at the Royal Botanic Garden Sydney, we have designed simple standardized workflows for conservation genomic studies of threatened plant taxa, making conservation genomics more accessible to conservation managers to assist with their conservation decision-making, to inform long-term recovery efforts.

Our workflows have assisted the conservation of more than 30 species in NSW to date, and here I present a range of the study outcomes to demonstrate how a single round of sequencing (i.e., a one-time cost) can produce multiple directly applicable outcomes and how generating information as early as possible can enhance conservation outcomes. Throughout the talk, I will showcase how the workflow guides efficient collection, analysis and application of genomic information across a range of threatened plants, and are directly relevant to the needs of the relevant stakeholders.