Impressive First International Conference on Reintroduction

Sanjay Molur *

The "First International Wildlife Reintroduction Conference: Applying Science to Conservation" held at Lincoln Park recently, was, by far, one of the best conferences I have attended in the field of wildlife/ conservation. The two-day conference even could have extended by two extra days and every minute of available time would have been filled up with experiences presented, opinions discussed, notes compared, posters displayed and statistics updated. A predominance of bird reintroduction examples did not take away from the conference its need for highlighting experiences from other taxonomic groups, which have been influenced greatly by bird experts who have built up a wealth of experience in many wildlife areas.

Presentations of interest, other than case studies, were on: What constituted reintroduction success, Disease risk assessment, the Science of reintroduction biology, Questions to be addressed by reintroduction practitioners and Restoration ecology contributing to reintroduction biology. These broad subject heads laid a solid foundation to addressing some banal problems and dilemmas in reintroduction practice around the world. The term reintroduction in all its connotations is used loosely causing considerable confusion, angst and trepidation amongst practitioners, enthusiasts and observers who are influenced by their own interpretations and tolerance to what is considered right or wrong in the context of reintroduction practices. An overwhelming desire to club many different forms of a release programmes under scientific reintroduction dictates projects and practices, but fortunately, the presentations and discussions did not delve into these aspects. It was interesting to note the disparity in definitions of reintroduction by the Reintroduction Specialist Group and others, but this was restricted just to definition and not practice.

The poster presentations displayed an immense array of practices and skills. Subjects related to scientific practices to animal welfare dominated issues underlined the diversity in this field. The most impressive of poster presentations was by Paul Pearce-Kelly and Aylin McNamara on Climate change impact considerations for reintroduction programmes (Box 2). Albeit a much debated topic, read in the context presented by Paul, the implications of this emerging threat looms large on the practices of reintroduction. A couple of South Asian examples were presented as posters, which were good to see.

If there was one area with a lacuna, it was the skewed participation from the 'developed' world. The map of participants highlighted big gaps from biodiversity rich countries in Central and South America, Africa and Asia. Presentations made on experiences from biodiverse countries were from experts from 'developed' countries; there was not one presentation from a native of any of those 'developing' countries. The conference had a distinct feel of reintroductions being a 'developed' country forte. Hopefully, the next conference will have presenters from both the 'developed' and 'developing' worlds.

The organisers intend to make this conference a bi-annual affair and are working out the modalities of setting up a process to solicit bids to host the next one. Hopefully the next one will match the enthusiasm and have a wider representation. A toast to the organisers, particularly, Joanne Earnhardt, Devra Kleiman, Fred Launay, Lincoln Park Zoo and the Reintroduction Specialist Group.

Subject break up of presentations
Reptiles 1, Birds 2, Mammals 5, Fish 1, General 20

Subject break up of posters
General 14, Amphibians 2, Birds 25, Invertebrates 1, Mammals 18, Reptiles 4

Climate change impact considerations for reintroduction programmes

Paul Pearce-Kelly and Aylin McNamara, *Climate Change Impacts Group, Zoological Society of London*

Efforts to better incorporate climate change impact dynamics into mainstream threat evaluation and conservation processes have realised some significant advances over the last year. These impact and conservation response considerations are, of course, equally germane to the reintroduction programme design, implementation and evaluation process. Shifts in ecosystem boundaries are likely to mean that current protected areas will increasingly be less likely to contain the species and habitats they were established to protect. Novel species assemblages, increased disease issues and human/wildlife conflicts are associated stress considerations. Conservation planners need to assess the vulnerability of habitat to climate change together with the target species climate change vulnerability traits. We will also increasingly need to identify potential sites that are not currently protected (and may well fall outside of the target species natural range) but which may have a higher conservation status under changed climate conditions. When such impacts are sufficiently taken into account it is likely that the conservation community will be faced with many species evaluation outcomes that project complete viable range habitat loss or other equally catastrophic situations. The traditional conservation approach has always been to prioritise the most threatened species but these climate change impact considerations challenge the viability of this approach. It is likely that rolling establishment and reintroduction programmes will become an increasingly essential and common conservation response.

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First International Wildlife Reintroduction Conference 2008: A personal perspective

Anand Ramanathan*

Conferences, workshops and symposia in the field of wildlife conservation, ecology and management, abound each year either in exotic locales or in elusive (read not so exciting) places usually bringing together people working on specific disciplines. But the first IUCN RSG International Wildlife Reintroduction Conference (IWRC) held at Lincoln Park Zoo in Chicago between 15th and 16th April, 2008 was different and important in that it not only brought together population and community ecologists, veterinarians, geneticists, wildlife managers, and many other experts from different wildlife disciplines, but also people working across a wide range of animals from vertebrates to invertebrates under a single arena. The aim of this conference was to promote the restoration of locally extinct wildlife populations by the reintroduction of captive-bred and wild animals and focused on the evolving field of reintroduction science. Due to the sudden increase in habitat loss and the fragmentation of wild animal populations, it has become increasingly challenging to protect wildlife habitats through field conservation efforts. Over the years, wildlife experts have suggested the use of captive populations in a complimentary capacity to support conservation of species and habitats.

Over 200 wildlife reintroduction researchers and practitioners from 30 countries in the world got together for the First IWRC which was aptly called "Applying Science to Conservation". The conference brought together many experts in the field of reintroduction science such as Doug Armstrong from Massey University, Philip Seddon from the University of Otago, Francois Sarrazin from University Pierre et Marie Curie, George Amato from the American Natural History Museum, Andrew Spalton from the Arabian oryx project in Oman, whose presentations assisted the audience to learn from past reintroductions, examine their failures, recognize the scientific processes that improved their effectiveness to be able to choose from the select successful approaches. Don Falk's (University of Arizona) presentation of putting reintroduction science into perspective vis-à-vis restoration ecology was particularly enlightening. Eloy Revilla's (*Council for Scientific Research, Spain*) talk on modeling with limited information and the relevance of individual-based spatially explicit models was helpful in visualizing the impact of reintroduction programs. Bruce Rideout from Zoological Society of San Diego gave an excellent talk about choosing the right diagnostic tests in assessing disease risks before reintroductions.

Attending this conference was learning and enriching experience for me. I am currently involved in several wildlife projects that deal with the rescue of wildlife, rehabilitation in captivity and their eventual release either through restocking or reintroduction programs. I was very keen on meeting experts in the field, discussing my projects with them and in receiving their thoughts and advice to help shape my projects' outcomes. I was also interested in improving my knowledge on the subject by attending talks and presentations featuring scientific and technological developments in the field. At conferences such as this one, I have often used the opportunity to build new relationships, initiate project ideas and to strengthen old collaborations. I have been extremely fortunate to receive brilliant ideas and solutions to my existing project issues and have also met students and researchers who are eager to work with me.

It was especially important to share IFAW's work amidst this audience about the opportunities and values of using orphaned wild animals contribute to restocking and reintroducing programs. IFAW's work partnered with Wildlife Trust of India and the Assam state forest department about the reintroduction of hand-reared orphan rhino calves from Kaziranga National Park to help repopulate Manas National Park was well received as a poster presentation.

It was also very evident from the presentations and the discussions that reintroduction programs can be expensive, complex and only some programs have been successful. The need for strong collaboration between wildlife managers, scientists, governments, ngos, zoos, and conservation centers and above all the involvement of the local community could not be more emphasized. The ultimate purpose of this conference was to unify a global community with similar interests who are passionate about building a culture of innovative theoretical and applied research on reintroductions and using these principles to initiate new strategies to reintroduce wildlife into their natural habitats.

I have attended several conferences over the years and each conference or workshop presents a unique opportunity to absorb new developments which could be harnessed and used in future projects. I strongly believe that conferences are an excellent tool for students and researchers to liaise and discuss ideas. In addition to gaining new information and developing research ideas, such conferences provide great networking opportunities. Most conferences offer scholarships and travel grants to encourage people to participate and present. Abstracts of presentations and posters from the conference are often published as compendiums and in international peer-reviewed journals offering students and researchers a chance to publish their scientific research. Meeting people and attending conferences forms a major facet in my work and I would like to use this opportunity to urge students, researchers, scientists, animal managers and wildlife professionals to do the same.

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First International Wildlife Reintroduction Conference: Applying Science to conservation, April 15-16, 2008

On Monday, April 14, a group of wildlife specialists and enthusiasts from all over the world gathered at the Lincoln Park Zoo in Chicago for Registration, a preliminary presentation and pre-conference social event. From that time onward, the science of reintroduction -- one of the most mis-used yet potentially valuable of the conservation tools in our arsenal -- took the stage. There were 220 attendees, 31 countries represented, 35 speakers, and 65 posters.

Organisers of the conference who gave its name and focus were wise, as the term "reintroduction" has been used to cover the least scientific releases of wild animals into the wild by the least scientifically oriented individuals and organisations. The most destructive actions are being permitted and even encouraged and carried out by governments. The first international reintroduction conference needed to make a statement, which the theme or focus did very well ... "Applying Science to Conservation."

It is a pity that more people from our region of South Asia could not attend. Many of the "wrong releases" are sited right within this region. Three South Asian people only could attend, all from India, e.g. Sanjay Molur, Co-Chair, RSG South Asia, Coimbatore; R.J. Rao, Jiwajai University, Gwalior, M.P. and Anand Ramanathan, IFAW, USA. We have asked them to share their personal perspective with us and if they do, it will be included at the end of this feature.

With this fact in mind we have "lifted" (with permission I assure you) most of the material in this feature about the conference from the website www.reintroduction.org, which was created by the organisers and Lincoln Park Zoo. We know that many people who are vitally interested in reintroduction generally or in this conference specifically (or should be) may not have had an opportunity to check the site or do not have very easy access to the web. Hence this detailed review. Also, being able to see the Abstracts at leisure may encourage more people to check the website www.reintroduction.org from time to time for the full papers in pdf. Proceedings will not be printed but most authors have indicated their willingness to allow their presentations to be uploaded as pdf's with a link to the Reintroduction SG website (www.iucnsscrsg.org). So that there is no confusion about ownership of the following material, all of it was taken off the Lincoln Park Zoo website link www.reintroduction.org. Watch this space which can also be reached from the RSG website www.iucnsscrsg.org in course of time.

The South Asian RSG group maintains a database of any type of release or translocation of wild animals to the wild. You are welcome to contribute information to it. Please write to us for the Excel format.

Write to marimuthu@zooreach.org, with a copy to herpinvert@gmail.com and sallyrwalker@aol.com.

From www.reintroduction.org.

Overview
Many wildlife populations throughout the world are suffering dramatic declines in size or are already extirpated. Habitat loss and degradation and the consequences of climate change are likely to further reduce the survival of many species, disrupt their distributions and disturb ecological function. An established conservation strategy to enhance the restoration of locally extinct populations is the reintroduction of zoo-bred and wild animals. Because reintroduction programs can be expensive, complex and risky, it may not be surprising that few programs have claimed success. However, the development of innovative approaches and a new culture of reintroduction science should improve the probability of success. This international wildlife conference will focus on the evolving field of reintroduction science.

The top experts in the field of reintroduction science:

- Presented "lessons learned" from past reintroductions
- Identified scientific processes that improve effectiveness
- Promoted multiple approaches to the science of reintroduction
- Began a culture of innovative theoretical and applied research on reintroductions

Conference Organizing Committee Coordinators:
Joanne Earnhardt, Ph.D., Director, Alexander Center for Applied Population Biology, Department of Conservation & Science, Lincoln Park Zoo, Chicago, Illinois, and Chair, Association of Zoos and Aquariums Reintroduction Scientific Advisory Group

Devra Kleiman, Ph.D., Zoo-Logic LLC, Chevy Chase, MD

Frederic Launay, Ph.D., Adviser for Environment to the Managing Director—Environment Agency, Abu Dhabi, United Arab Emirates and Chair, IUCN/SSC Reintroduction Specialist Group (RSG)

Steering Committee:
Phil Seddon, Ph.D., University of Otago, New Zealand

Mike Jordan, Chester Zoo, England

Francois Sarrazin, Ph.D., Pierre and Marie Curie University, Paris, France

Invited speakers and abstracts
1st International Wildlife Reintroduction Conference

Esteemed scientists presented their work on the science of reintroductions:

New areas of genetics research employed in the design, implementation and assessment of endangered species reintroduction efforts.

George Amato, *Sackler Institute for Comparative Genomics, American Museum of Natural History, New York, New York 10024*

The accelerating rate of extirpations of fragmented populations of endangered species requires a much more active management of these populations if the extinction of that species is to be avoided. Similarly, for the suite of species for which successful *ex situ* conservation programs are in existence in spite of extinction in the wild, only intensive management, including reintroduction, offers the only hope of survival. Research applications from the fields of molecular genetics and genomics provide powerful new approaches to improving efforts in endangered species reintroductions. These include detailed genotyping of present and historic *in situ* and *ex situ* populations, accurate empirical analysis of pedigree information, genetic analyses at a landscape level examining relevant biotic and abiotic factors, and even assessments of quantitative genetic characters associated with fitness. Examples of these areas of research in current conservation programs will be presented along with a suggested protocol for future reintroduction efforts.

What questions should reintroduction practitioners try to address?

Doug P. Armstrong, *Wildlife Ecology Group, Massey University, Private Bag 11222, Palmerston North, New Zealand*

A major criticism of past reintroduction programmes has been their failure to learn from the process and therefore to improve our ability to recover species and restore ecosystems. The amount of research on reintroduction has increased dramatically over the last 15 years. However, as Phil Seddon will advocate in his talk, a more strategic approach is needed whereby the research accompanying reintroduction projects targets key questions identified *a priori*. Here I will briefly outline a set of 10 general questions that should be considered (see Trends in Ecology & Evolution 23: 20–25), and then consider how reintroduction practitioners should decide which of these question(s) to focus on in any particular project. The first issue is to consider where the uncertainties lie with respect to the persistence of the species at the site and the effect on the ecosystem. For example, if the key uncertainty is whether the habitat has regenerated to a condition that can support the species, practitioners should focus their research effort on this question rather than being distracted by red herrings such as "soft vs. hard" release, numbers released, disease screening and genetic variability. The second issue is to consider the opportunities to produce research results likely to have wide application to other projects. I suggest that reintroduction practitioners need to work less on a case-by-case basis and make greater effort both to build on prior information and to produce information that can in turn be incorporated into subsequent projects.

Transfer of existing scientific know-how on species re-introductions can help to improve reintroduction plans of related species

Peter Beeck[1], Philippe Jatteau[2], Thierry Rouault[2], Richard St. Pierre[3], Heiner Klinger[4].
[1]*Stiftung Wasserlauf, Projekt Maifisch, Aquazoo Löbbecke Museum.* [2]*CEMAGREF.* [3]*1315 Buckwheat Road, Millerstown, PA 17062, USA.* [4]*Bezirksregierung Arnsberg.*

Historically, the Susquehanna River was a major producer of American shad (*Alosa sapidissima)* on the Atlantic coast of the United States. However, significant environmental problems led to the virtual extirpation of American shad in the Susquehanna River. Fish reintroduction and project evaluation activities have been undertaken over a three-decade period by numerous state, federal and utility company partners. The shad population returning to the lowermost dam on the Susquehanna grew from only a few hundred to a maximum of over 200,000 fish in the past years. The reintroduction was accompanied by extensive scientific research on fish culture, marking, stocking and monitoring techniques. In a new European project on the re-introduction of the closely related allis shad (*Alosa alosa*) to the River Rhine the existing scientific work on the re-introduction of the American shad was tested for applicability in a feasibility study; i.e. artificial reproduction of shads with hormone stimulation and fish mass marking with Oxytetracycline. In both cases the application of existing experimental protocols also worked for the related species. In the case of artificial reproduction even better results could be obtained under certain circumstances. Both techniques are now implemented in the reintroduction plan of allis shad.

Are avian reintroduction protocols a model for other animals? A test comparison of avian and reptile reintroductions on New Zealand islands

Charles H. Daugherty[1], Kimberly A. Miller[1], Nicola J. Nelson[1], Susan N. Keall[1], David R. Towns[2].
[1]*Victoria University of Wellington.* [2]*Department of Conservation.*

Worldwide and in New Zealand, reintroduction protocols have most frequently been designed for and tested upon birds. However, birds may be a poor choice as a model because many aspects of their biology are not representative of the animal kingdom, for example, homeothermy, relatively large size and detectability. We compare the results of 18 reintroductions of reptile species with 29 avian reintroductions on New Zealand islands where the probable primary cause of local extinction, invasive mammalian predators, has been removed, and we evaluate how differing biological characteristics between the classes affect translocation outcomes. Unlike birds, tuatara and lizards increased in body condition and size after translocation, indicating indeterminate growth. The resulting higher reproductive output could lead to more rapid recovery than anticipated, even in K-selected species. However, cryptic behavior, low detectability and low intrinsic rates of increase can make assessments of success more difficult for reptiles than for productive and visible birds, even 10 years after the reintroduction. Additionally, genetic bottlenecks and performance-related consequences of inbreeding were detected despite rapid increases in population size. We conclude that biological differences mean that protocols should be extrapolated with great care from one taxon to another; mistakes can be expensive and even dangerous.

The who, where, what, when, why and how of avian reintroductions

Joanne Earnhardt, *Alexander Center of Applied Population Biology, Lincoln Park Zoo, Chicago, IL*

Hundreds of releases of avian species have occurred in reintroduction and translocation programs over the last two decades. Thus, scientists and managers who are planning future releases are not developing their plans in a vacuum; they have an opportunity to gather information from past releases. Yet gathering this information is a challenge as it is dispersed over many different sources and media. In addition, the variables that impact the efficacy of releases are diverse, ranging from the species' biology and ecology, habitat suitability, demography and genetics to management. To centralize this information, we developed a comprehensive, standardized database, the Avian Reintroduction and Translocation (AVRT) database. Data were collected from a wide range of sources, including peer-reviewed and gray literature, and the AVRT is now populated with data for releases of 128 species at 405 sites and 602 release events. In this presentation I use Guam rails as a species example; data on what birds and when and how they were released in different sites were extracted from the database and identify different release approaches depending on the reason for release. In analyses across programs, I use the entire database to produce descriptive statistics such as which species are released by order, diet, IUCN status, how the source influences mortality, how many birds are released per event and per site, and what types of habitats. The AVRT with data on factors in past releases is available on our web site to inform managers and scientists as they plan future releases.

(How) can the science of restoration ecology contibute to the science of reintrodcution biology?

Don Falk, *The University of Arizona*

Reintroduction of species and populations occurs within a larger context of a pervasively and rapidly changing world. Among the drivers of this change are climate variability and trend, major shifts in land use and landscape configuration, and alterations to natural disturbance regimes. These drivers are superimposed on the existing dynamics of ecological systems, which have properties of temporal variability, heterogeneity, complexity, and stochasticity. Each of these drivers of change affects not only the ability to reintroduce species successfully, but also the significance of reintroductions to the conservation of biological diversity. For example, in addition to reintroduction in the strict sense, assisted migration has been proposed to help species adapt to a changing ecological template. Similar proposals have been made regarding disturbance regimes and active management of the landscape matrix, in an adaptive and incremental framework. The field of restoration ecology is undergoing a similar evolution, from a literal interpretation of historic reference conditions to more process-centered models. This new, dynamic restoration paradigm internalizes the inherent properties of ecosystems as they are understood today (temporal variability, heterogeneity, complexity, and stochasticity). Instead of being left behind as past-oriented, a revised restoration paradigm can reposition the field of restoration ecology to play a key role in adaptive strategies in a rapidly changing world.

A strategic plan for augmenting desert tortoise populations in the southwestern United States

Kimberleigh J. Field, *U.S. Fish and Wildlife Service*.

The recovery strategy for the threatened Mojave Desert tortoise consists of several key elements, one of which is the augmentation of depleted populations via a strategic program. The program's goals include maintaining tortoise populations in the wild for the continued study of threats to the species' persistence and hastening recovery of decimated populations following mitigation of threats. The U.S. Fish and Wildlife Service is drawing from research conducted by numerous entities to develop the strategic program for desert tortoise population augmentation. To date, head-starting research has shown promising results in increasing nest success, first-year hatchling survival rates and growth rates under semi-natural conditions. Initial success in translocation of adult tortoises appears to be high. Genetic studies have revealed putative populations important in conserving the range-wide diversity of the desert tortoise. Disease studies have documented exposure to important pathogens and suggest existence of natural antibodies to some pathogens. Population monitoring in combination with a new habitat model is helping to identify areas in which to focus efforts, and research into site-specific threats has revealed complex and interacting factors. Although the long-term effects of augmenting populations of this long-lived reptile will not be immediately evident, the existing data suggest that decimated populations would not make strong strides toward recovery without such a research-based augmentation program.

A model for evaluating reintroduction success

Markus Gusset, *Wildlife Conservation Research Unit, University of Oxford*

As a model for assessing reintroduction success, I evaluated one of the most extensive efforts to date to reintroduce an endangered species, namely the establishment of an actively managed meta-population of African wild dogs (*Lycaon pictus*) in South Africa. This intensive management approach involves the re-introduction of wild dogs into suitable conservation areas and periodic translocations among them. Analyses of individual survival and population viability suggested that the crucial issue for wild dog reintroductions to be successful is dispersal behavior "natural or artificial" and the outcome thereof, the formation of new packs, given the dependency of wild dogs to live in a cohesive social group for survival and reproduction. This case study provides several lessons for reintroduction biologists: it illustrates the virtue of setting measurable objectives and defining criteria with which to gauge reintroduction success; it presents two modeling tools for assessing short- and long-term reintroduction success; it highlights how reintroduction success may be related to unanticipated factors and accordingly has changed reintroduction practice; it proposes future avenues for investigation specifically targeted at improving reintroduction success; and, maybe most importantly, it demonstrates the importance of monitoring and evaluation in reintroduction programs.

Importance of long distance dispersal to conservation of swift fox in the Northern Great Plains

Kevin M. Honness[1], Shaun Grassel[2], Jonathan A. Jenks[2]. [1]*Turner Endangered Species Fund.* [2]*Department of Fish and Wildlife Resources.*

Long-distance dispersal (LDD) events have the potential to overcome difficulties posed by isolation and habitat fragmentation. However, their rarity make LDD events difficult to document both in frequency and magnitude and are likely under-estimated in importance to conservation efforts. This may be especially true for swift foxes (*Vulpes velox*), which are thought to exhibit limited dispersal abilities. We trapped, translocated, released and monitored 276 swift foxes (144 females, 132 males) that were reintroduced or wild born on private lands in western South Dakota and on the Lower Brule Indian Reservation, South Dakota from 2002 to 2006. We recorded 12,302 relocations using aerial- and ground-based telemetric monitoring. Overall dispersal distance from release sites averaged 27.2 $\pm$ 7.7 km. For our purposes, LDD was defined as distances greater than the 95th percentile, or 73.9 km. We documented 14 such events with an mean distance of 167.9 km. Results indicate that both reintroduced and wild-born foxes travel widely enough to provide connectivity between three reintroduction areas and the remnant native population in South Dakota. Documented LDD events may indicate the ability to provide metapopulation connectivity to core populations within the Northern Great Plains region such as those found in Colorado, Montana, Nebraska and Wyoming.

Founder effects and inbreeding and their consequences for small island reintroduction programs

Ian G Jamieson, *University of Otago, New Zealand*.

Genetic factors may be the rate-limiting step in ensuring population recovery and long-term survival in reintroduction programs focused on small isolated islands. Most of the evidence for inbreeding increasing the risk of extinction of small populations comes from models that assume such populations harbor considerable genetic load and express a large number of lethal equivalents summed over several life-history traits. We are in the unique position of testing these assumptions by collecting pedigree and fitness data from several species of endangered New Zealand birds that have been translocated as part of reintroductions to small islands. At our island study sites, we known the kin-relations of all birds and the fates of most nesting attempts. Our studies indicate that even when the number of founders is relatively small, the mean level of inbreeding increases only slowly as long as the reintroduced population grows steadily. Inbreeding depression was detected in some life history stages but not others, did not prevent populations from establishing, and is likely to play a minor role only in increasing the risk of extinction relative to the risk of re-invasion by exotic predators. We see the management of genetic factors in reintroductions as potentially enhancing the recovery process of threatened species rather than directly reducing the risks of extinction.

Reintroduction of the otter (*Lutra lutra*) in the Netherlands: hidden life revealed by non-invasive genetic monitoring

Hans Peter Koelewijn and Hugh A.H. Jansman, *ALTERRA—Wageningen UR*

In 1988 the otter went extinct in the Netherlands. The otter was regarded as the flagship of Dutch wetlands. Therefore, a reintroduction was started in 2002 with 26 otters, mainly originating from Eastern Europe. Besides traditional telemetry a non-invasive genetic monitoring was started. From all released individuals a genetic fingerprint was collected. Next, a sampling protocol was developed based on extracting DNA from freshly collected spraints (droppings). During the period 2002–2006 we collected DNA profiles from 205 spraints (out of 558 collected spraints). Because we are working in a "closed" population (there are no other otters in the Netherlands) and genotyped our population beforehand, we know what went in the population. This provides the unique situation of tracing the life of the elusive otter, because detailed information on i) territory use, ii) social structure, iii) paternity and newborns (pedigree) and iv) dispersal of individuals was collected. Moreover, the problems related to non-invasive genetic sampling could be properly evaluated. Besides, information on the dynamics of genetic diversity in a small isolated population was obtained, which allowed us to get a reliable estimate of the Ne (effective population size). Based on the genetic results it was decided to change the release strategy.

Evaluation of the conservation impacts of fish introductions

Heather Koldewey[1], Janelle MR Curtis[2], Gordon M Reid[3]. [1]*Zoological Society of London.* [2]*Pacific Biological Station, Fisheries and Oceans Canada.* [3]*North of England Zoological Society.*

We present the first comprehensive review of the impacts of fish introductions worldwide. Our analyses were based on a literature review and on introduction records in FISHBASE. There are reports of more than 755 non-indigenous marine and freshwater fish species from 144 families, introduced to more than 200 countries. The majority of reported introductions (67 percent) are freshwater and most (67.9 percent) are intentional. Such introductions are mainly for commercial purposes, but also for biological control, research and conservation. The balance of these intentions has shifted over time. Determinants of "success" for fish introductions vary depending on the economic, social and biological criteria employed, which differ between fisheries biologists, aquaculturists and the conservation community. Our review shows that few introduction records report socioeconomic benefits, while most literature indicates strong negative ecological impacts. The high uncertainty associated with socioeconomic impacts is because these are largely unmonitored following introductions and few studies (less than 2.5%) focus on the socioeconomic implications of introductions. Following introduction, zoogeographically widespread, euryoecic species and those with some parental care seem to be at an advantage in their ability to become established, while predators evidently have none. The key recommendation is that strong precautionary principles should apply to fish introductions and that existing guidelines are followed.

PVA informs managment of captive breeding programs for reintroductions: An island fox example

Colleen Lynch[1] and Phil Miller[2]. [1]*University of South Dakota.* [2]*Conservation Breeding Specialist Group.*

Population Viability Analysis (PVA) is an important tool in the management of captive breeding programs for reintroductions. As an example, PVA was used to explore questions regarding management of island fox (*Urocyon littoralis*) captive breeding efforts. Are current *in situ* captive breeding populations sufficient to: 1) reduce extinction risk to acceptable levels? 2) maintain gene diversity at acceptable levels? 3) provide adequate numbers of release specimens? Should *ex situ* captive breeding facilities be added? Which of four managed subspecies should populate *ex situ* captive breeding facilities? Analyses using Vortex 9.5 were used to determine target population sizes for existing *in situ* captive breeding facilities and potential additional *ex situ* captive breeding facilities. These target sizes were determined with consideration for the estimated extinction risk, projected gene diversity retention and maximum sustainable harvest rate for existing and potential captive breeding populations. These analyses were combined with evaluations of financial, veterinary and logistical concerns to construct Island Fox Recovery Coordination Group recommendations to the US Fish and Wildlife Service for future island fox management. The results of these analyses and subsequent management recommendations are presented as a model of PVA as a decision tool for managed breeding and reintroduction programs.

Resolving the tension between science and management in reintroductions

Devra Kleiman—(moderator). *Zoo-Logic LLC, Chevy Chase, MD*

There is an inherent conflict between those who want to recover a species as quickly as possible and those who wish to use a scientific/experimental approach to a recovery program. This may lead to compromises that neither benefit the science nor the recovery itself. Few reintroduction programs are ever sufficiently scientifically based to evaluate relative success or to determine the most cost effective approaches. Part of the problem, especially with reintroductions using captive-born animals, is the plethora of variables that must be controlled in order to test only a few hypotheses and the fact that most endangered species populations are small. This panel will explore with scientists, practitioners and managers how to achieve the balance between recovering a species and increasing our knowledge base to improve future recovery programs.

Effects of differing ecology and taxonomy on the facilitation and evaluation of reintroduction success

Axel Moehrenschlager, *Centre for Conservation Research, Calgary Zoological Society, 1300 Zoo Road N.E., T2E 7V6, Calgary, Alberta, Canada*

North American conservation efforts are increasingly habitat-based and reintroductions, which are generally species-specific and expensive, may not attract the support of government agencies or conservation managers. Monitoring extant and re-established populations of reintroduction species is crucial to refine captive-breeding techniques or assess the suitability of species such as whooping cranes (*Grus americana*) or Vancouver Island marmots (*Marmota vancouverensis*) for release. However, political pressure has also mounted to down-list imperiled species and managers consequently demand relevant and timely data regarding the demographics and geographic distribution of reintroduced populations. Successful swift fox (*Vulpes velox*) reintroductions in Canada and northern Montana have benefited from life history, census, habitat suitability and population viability data that have been collected over the last two decades. This information is now being utilized by government agencies to implement conservation policies that will help to protect the population over time. In contrast, over two decades of burrowing owl (*Athene cunicularia*) reintroductions in British Columbia have been challenging to evaluate because survival rates of these small, migratory birds are difficult to estimate. Ecological differences between life-stages and large-scale variation in the annual population dynamics of reintroduced northern leopard frogs (*Rana pipiens*) in Alberta also hamper estimations of population sustainability. Consequently, the choice of reintroduction species should not only be based on the biological or socio-economic parameters that are necessary for reintroductions to proceed, but also on the life-history and ecological characteristics that are conducive to obtaining data for statistically defensible evaluations of reintroduction success over time.

Reintroducing 'Ratty'

T.P. Moorhouse, M.C. Gelling, D.W. Macdonald.
Wildlife Conservation Reserach Unit, University of Oxford

There is growing interest in which factors influence the "success" of reintroductions, and a recognition for the need for an experimental approach towards testing these. We present a replicated reintroduction experiment on an endangered British rodent, the water vole. Water voles (*Arvicola terrestris*) underwent the largest decline of any British mammal in the last century. Reintroductions are growing in popularity as a tool for the reversal of this decline. We undertook 12 replicated reintroductions in which habitat quality varied between sites. Initial modeling work suggested that all sites could support a viable population of water voles. We tested the hypothesis that the proportion of the release cohort establishing, the subsequent survival and breeding rates and the resultant population densities would be higher at sites supporting a greater abundance of suitable habitat. Water voles established and bred at eight sites. The cause of failure at the remaining sites was unrelated to habitat quality. At high quality sites, more of the release cohort survived and post-establishment survival rates and population sizes were larger. These eight reintroductions were "successful", but only a proportion were "optimal" for this species. In this case, "success" ignores the ethical considerations of releasing individuals into potentially sub-optimal habitat.

Introducing ungulates to unfamiliar environments: Behavioral and endocrine responses in bighorn sheep

Amanda Leigh Murray and Johan T. du Toit,
Department of Wildland Resources and the Ecology Center Utah State University

Restoring bighorn sheep to their former range requires active metapopulation management involving frequent translocations between subpopulations and reintroduction to new areas. One strategy is to maintain a closely monitored non-hunted subpopulation in a predator- and disease-free environment, such as Antelope Island State Park (AISP) in Utah, for use as a source from which to regularly translocate batches of selected animals. Potential problems, however, include (1) susceptibility to cougar predation when *naïve* bighorns are released, (2) decreased immunocompetence caused by poor nutrition and elevated stress when adults are released during winter into unfamiliar environments with new social hierarchies and (3) dispersal of introduced animals into areas occupied by domestic sheep, leading to further disease concerns. A study is currently underway to compare pre- and post-translocation vigilance behavior and fecal glucocorticoid profiles in a group of 45 bighorns scheduled for translocation from AISP. The same comparisons are also being made between animals raised on AISP and those "wild-raised" in the planned release area (Stansbury Mountains, UT), while post-release ranging patterns of AISP-raised animals are being compared with those of "wild-raised" residents. Data collection is stratified by age and sex class to identify the optimal composition of groups for future translocation efforts.

Models for complex questions: Individual-based spatially explicit models in reintroduction research

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Individual-based spatially explicit models are commonly used in many scientific disciplines and reintroduction research is no exception. Due to their unlimited flexibility, they are most useful when investigating complex systems in which there are one or several feedback processes. Apart from their flexibility, we can cite the following advantages: they can generate data at multiple levels of resolution (that can be sampled and analyzed with the same experimental and statistical techniques as field data) and they offer the capacity to answer case specific questions. Between the drawbacks we can cite that we need specific programming skills or a specialist modeler, their development is time consuming and they do not offer closed solutions. However, their use in ecology and conservation biology has been criticized for being unnecessarily complex, difficult to analyze and prone to error propagation. These criticisms are based on the presumption that modeling of complex systems falls within the statistical modeling paradigm. Focusing on model complexity defined as the number of parameters alone, and not on the structural realism of model processes, is one of the most topical misconceptions. This type of models can be as simple as any other, with complexity determined only by the complexity of the question they are built for. I will review the main properties of this type of models by using two examples on reintroduction research. In the first we show that the dense road network in Germany will limit the establishment of a large spatially structured population of Eurasian lynx in the available potential habitat. In the second, we develop an adaptive management plan for the conservation of one population of Iberian lynx, showing that under some specific conditions the

IUCN Reintroduction Guidelines should not be followed (or the Guidelines should be modified).

Translocation and early post-release demography of endangered laysan teal

Michelle H. Reynolds[1], Mark Vekasy[1], John Klavitter[2], Nathaniel Seavy[1]. [1]*USGS Biology Pacific Islands Ecosystem Research Center, PO Box 44, Hawaii National Park, HI 96718.* [2]*USFWS Midway Atoll, NWR*

Translocation is a tool to restore endangered species, yet most reintroductions lack the post-release monitoring needed to assess early population establishment or failure. Hawaii's Laysan teal (*Anas laysanensis*) provides an example of the conservation challenges facing many island species. Attempting to reduce the high extinction risks, we translocated the endangered ducks to a portion of their presumed prehistoric range. We monitored survival and reproduction using radio telemetry for two years after the first release. Forty-two wild Laysan teal were sourced directly from the only extant population on Laysan Island and transported two days by ship to Midway Atoll. The birds spent a mean of 9.4 days (? SD 4.0 d) in captivity. All birds survived the translocation with nutritional and veterinary support. Post-release survival was 0.857 (95% CI 0.857–0.989) or annualized 0.92 (95% CI 0.83–0.98). Seventeen of 18 founding hens attempted nesting, producing 46 nests in the first two breeding seasons. The effective founding female population (Ne) was 13 of 18. We describe reproductive and habitat use plasticity between source and re-introduced populations and used resultant demographic rates to model population growth. The nascent population size increased to more than 100 after only two years post-release (?=1.56). If this growth rate continues, the size of the Midway population could surpass the source population (~500 total birds) within 10 years.

Disease risk assessment for reintroductions: Are we relying on the wrong data?

Bruce Rideout, Alan Lieberman, Pat Morris, D.V.M.
Zoological Society of San Diego

The traditional approach of developing a list of diseases of concern, testing animals for those diseases and making release decisions based on the test results suffers from several fundamental problems, including a misunderstanding about diagnostic test performance and interpretation. This leads to reliance on potentially misleading test results for critical decision-making. We propose a different approach. First, we assign a qualitative risk category to each population. Movement of animals between similar risk categories reduces opportunities for inadvertent disease transmission. This often reveals that animals destined for reintroduction require greater biosecurity than zoos have traditionally provided. Second, we believe long-term necropsy data from the population is far more important than results of screening tests performed on individual, apparently healthy, animals. Comprehensive postmortem evaluations suffer from few of the problems associated with diagnostic test performance, and have the advantage of providing surveillance for a wide range of agents of concern (both anticipated and unanticipated). Comprehensive necropsy and clinical data combined with judicious use of carefully selected surveillance tests has the greatest potential to reduce disease risk for reintroduction programs. We propose that zoos engaged in reintroduction efforts place more emphasis on population-level biosecurity and comprehensive postmortem investigations to mitigate disease risk.

Application of behavioral ecology to captive breeding and reintroduction programs of lekking bird species

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In lekking bird species, the "good genes" model of sexual selection assumes that males differ in condition and viability and that this difference can be inherited. Furthermore, parents can affect the quality of their offspring via the allocation of non-genetic resources. We empirically verified these two assessments on peafowl. Both behavioral displays and feather ornaments of males used by females to choose a mate honestly reflect heath status. In addition, females paired with more ornamented males laid larger eggs with higher amounts of testosterone into the yolk. If ornamented males do transmit good genes, the maternal differential investment can amplify the effect of such good genes on the offspring fitness. Similar results were obtained in the houbara bustard, an endangered species bred in captivity to restock wild populations. Experiments showed that health status of males was related to intensity of display, semen quality and hatchability. Current data seems to indicate that father genetic quality could also be related to ability of their progeny to survive after release. In breeding programs, potential mates are chosen on the basis of genetic and demographic considerations to maintain genetic diversity by equalizing founder representation while minimizing inbreeding. However, this strategy may increase the genetic load of the population. When effective population sizes are adequate, it could be valuable to propose that sexual selection be given more room in conservation breeding programs. When the "good genes" model is expected and when potentials mates differ in their heritable viability, minimizing reproductive skew might not be the best conservation strategy. Decisions regarding mating could also be manipulated to optimize parental investment.

On the relationship between reintroductions and spatial ecology

David Saltz, *Ben Gurion University of the Negev, Israel*

Spatial ecology and reintroductions are strongly linked. Central topics in spatial ecology, such as the metapopulation, corridor and SLOSS paradigms, are important during the planning stages of reintroductions, while empirical spatial data, such as home range establishment and other movement patterns, are useful in evaluating the success of reintroductions over the short term. At the same time, reintroductions can play a key role by producing important empirical results in the field of spatial ecology, some of which are relevant to conservation. As an experiment in spatial ecology, reintroductions offer a unique opportunity stemming from the fact that reintroduced individuals must establish themselves in an unfamiliar area and as such their behavior in space is presumably similar to that of dispersing individuals. With the advance of current tracking technology, new insights can be gained in the emerging field of movement ecology. In reintroductions that rely on repeated releases, questions addressing movement ecology may be especially telling as trends in dispersal resulting from increased presence of conspecifics (and hence increased competition for space) emerge. Spatial ecology was a significant component in the planning stages and in the evaluation of the success of reintroductions of Persian fallow deer (*Dama mesopotamica*) and Arabian oryx (*Oryx leucoryx*) in Israel. We also used the process to investigate various topics along the seam between conservation and spatial ecology. These reintroductions were based on multiple releases in multiple locations relying on a metapopulation-corridor approach. For the fallow deer, we evaluated seasonal home range dynamics and compared our findings with other cervids to determine if the reintroduced individuals utilized space similarly to other wild cervids. We also used movement patterns to assess the impact of multiple releases in both reintroduction programs. Changes in male territorial behavior of reintroduced Asiatic wild ass (*Equus hemiounus*), combined with the movement of females, provided insight into how such processes influence effective population size. Conditions at the breeding facility and age also influenced the spatial behavior of the reintroduced animals and their ability to establish themselves spatially in the wild. Currently we are focusing on two topic related to spatial ecology: (1) How does absence of information about space affect the movement behavior of individuals and (2) what is the role of the species in dispersing plant seeds and how does it contribute to the genetic flow and neighborhoods of various plant species. This latter topic is intended to provide support to the importance of reintroductions for ecosystem restoration.

The use of PVA to define success criteria in reintroduction.

François Sarrazin*, University Pierre et Marie Curie, Lab Conservation des Especes, Restauration & Suivi des Populations, UMR 5173 MNHN-CNRS UPMC, 61 Rue Buffon, 75005 Paris France.*

The strong and recent development of reintroduction science mostly aims at improving reintroduction success. However, despite numerous recommendations and meta-analyses, there is no general agreement on the definition of reintroduction success criteria. Restoration ecology already set up a detailed list of success criteria for ecosystem restoration that could provide directions for reintroduction. Indeed, sustainability, resilience and connection clearly remind that long-term population viability is the ultimate goal of these programs. Nevertheless, if all agree that reintroduced populations should be viable, we still need general approaches, targets and threshold to define success. I propose simple elements that may help to structure these issues and may be widely used among reintroduction programs. First, it seems necessary to distinguish between global versus local targets. In the first case, reintroduction is necessary for the conservation of a globally threatened species. In the second one, reintroduction is locally important but concerns a species that is not globally threatened. Second, we can split reintroduced population dynamics into three basic phases: settlement, growth and regulation. Their duration may vary, and they can even overlap, but in each phase, PVA approaches may help to define success criteria accounting for individual and environmental quality. Finally, the ultimate long-term success relies on the third phase, where IUCN Red List criteria for viability may be used at a global or regional scale according to the type target previously defined. Examples based on long-term studies on scavenger reintroduction in Europe will be used to illustrate these proposals.

Developing the Science of Reintroduction Biology

Philip J. Seddon, *Department of Zoology, University of Otago, PO Box 56, Dunedin, New Zealand*

When the last members of a species have been lost from parts of their historical range, often the only option for restoration is through reintroduction, involving the translocation and release of either captive or wild-caught individuals. High-profile programmes in the 1970s and 80s raised awareness of reintroduction as a conservation tool and contributed to a proliferation of new management projects, many poorly planned. Subsequent low success rates of reintroductions worldwide led to calls for improved post-release monitoring, Since 1990, there has been increased collaboration between reintroduction practitioners and researchers. This has resulted in an exponential increase in the number of peer-reviewed publications related to wildlife reintroductions, and there is now a recognizable field of reintroduction biology. However, a recent review (Seddon, Maloney & Armstrong *Conservation Biology* (2007) 21: 303-312) indicates that much of the research so far has been fragmented and *ad hoc*, consisting largely of descriptive accounts. Studies have often addressed questions retrospectively based on the available data, rather than the data being collected in organized attempts to gain reliable knowledge to improve reintroduction success. Using examples of fruitful research approaches, I suggest there is scope to improve reintroduction biology by advancing beyond simple observation and description of patterns (inductive reasoning) to formulation and testing of theory, particularly through the use of modeling tools and well-designed experiments. There is also need for a more strategic approach, whereby research and monitoring focus on questions identified a priori to be relevant to improving reintroduction success

(Armstrong & Seddon *Trends in Ecology and Evolution* (2008) 23: 20-25), with different questions focusing at the population, metapopulation and ecosystem level. The specific questions will be outlined in Doug Armstrongs talk. I conclude with a summary of ways in which a more strategic approach to reintroduction biology can develop under the proposed framework.

Behavioral theory to the rescue? How manipulating the behavioral environment at time of release can increase reintroduction success

Debra Shier and Ronald Swaisgood, *CRES, Zoological Society of San Diego*

Practitioners of reintroduction programs face two truisms: (1) the majority of these programs fail and (2) post-release monitoring is insufficient to determine the reasons for failure. A way forward is a hypothesis-testing approach in which competing, but plausible, theories are tested against one another. Here we offer a theoretical framework for some of the most promising ideas in behavioral ecology applied to reintroduction programs, identify behavioral mechanisms that can be manipulated and present real-world results from such an approach. We provide a brief overview of several of these ideas, but focus on three. (1) Two mechanisms known to guide dispersal and habitat settlement—conspecific attraction and natal habitat preference induction—can be influenced by alterations in the pre- or post-release environment to overcome maladaptive post-release behavior. (2) Founder group familiarity may promote release site settlement and substantially increase post-release survival by maintaining social interactions among group members. (3) For captive animals raised in an artificial environment, development of effective anti-predator behavior may depend on predator training in appropriate social contexts.

Reintroduction of Przewalski's horses to the Kalameili Nature Reserve in Xinjiang Province, China: Challenges and opportunities?

Melissa Songer, Wynne Collins, Steve Monfort, Peter Leimgruber, *Smithsonian National Zoological Park*

The Przewalski's horse's (*Equus ferus przewalskii*) demise, in the wild and captivity, is well known. These last true wild horses were extirpated from the wild by the mid-1960s. In 2001, the Wild Horse Breeding Centre initiated the reintroduction of Przewalski's horses to Kalameili Nature Reserve (KNR), Xinjiang Province, China. However, KNR is used heavily as winter pasture by nomadic herders. Ongoing reintroduction efforts may not be compatible with the existing livestock management, because of grazing competition, risk of disease transmission and interbreeding between domestic and wild horses. We used interview surveys to determine the importance of KNR for local herdsmen and to identify win-win management scenarios. We also initiated post-release monitoring of Przewalski's horses using satellite transmitters. To assess domestic horse and Przewalski's horse interactions, we plan to deploy GPS transmitters on domestic stallions. Results show that Przewalski's horses use a small area of the KNR, but these areas also appear to be prime winter pastures. Interview surveys revealed that many families depend on the winter pasture but are interested in alternative solutions, especially if they lead to better educational and economic opportunities. Data on the interactions between domestic and Przewalski's horse stallions should be available by spring of 2008.

The Arabian Oryx Project, Oman

Andrew Spalton, Salah Salim al Madhdouri, Yasser Hamdan al Kharousi, *Office of the Adviser for Conservation of the Environment, Diwan of Royal Court, Muscat 113, Oman*

Oman's Arabian Oryx Project set standards for large mammal reintroductions in the 1980s and early 1990s. It received global applause not only for successfully achieving a viable wild population but for doing so hand in hand with the local community of pastoral Bedouin. However, in 1996 as the wild population topped 450 oryx, utilizing over 21,000 km2 of desert, the Oryx Project began 10 long years during which poaching for illegal trade decimated the wild herds. This paper considers the collapse of the wild population, ways forward and implications for reintroductions in the region.

Reintroduction as a technique to restore ecological communities and improve regional conservation

Zena Tooze[1], Lynne Baker[2], Sagan Friant[1].
[1]*CERCOPAN.* [2]*Conservation Biology Program, University of Minnesota*

Sites selected for the reintroduction or supple-mentation of populations are often protected areas, such as national parks, and such projects usually focus on a single endangered species. The use of reintroduction as a method to restore ecological communities using multiple species, which may not be endangered, or increase the number or size of protected areas is less common. In relation to other mammalian reintroductions, we present data on site selection and the mitigation of causes of decline for a reintroduction of two non-endangered African Cercopithecine monkeys, with the aim of re-establishing a historic primate community in a legally unprotected forest in Nigeria. The process, carried out over several years, involved biological surveys, local community participation and consideration of connectivity with protected areas. Mitigation activities included establishing a no-hunting zone, creating protection for primates in community forest, and establishing economic benefits for the local community. Socioeconomic survey data show that 90 percent of hunters support the reintroduction project. We illustrate how this approach to reintroduction, in terms of both the site and species, can benefit regional conservation by increasing number of forest sites protected from human disturbance and restoring community structure, at least for one mammalian order.

California condor: Lessons learned in recovering a K-selected Species

Mike Wallace, *Zoological Society of San Diego*

Recovery of the California condor (*Gymnogyps* *californianus)* focuses on captive breeding and reintroduction to the wild. From a wild population low of 19–22 birds in 1980 there are now 305 individuals with 160 in captivity and 145 wild released birds at five sites within their former range. Close to extinction, all wild condors were captured by 1987. With 27 condors (14 founding lines) in 1987, captive breeding at four zoos stalled extinction and refocused the program on re-establishing condor populations in the wild. Without wild mentors to emulate, pre- and post-release training includes power pole aversion and evolving rearing methods to increase survivorship and encourage normal behaviors. Continuous carrion proffered in release areas support the fledgling populations as foraging traditions are developed. Radio-telemetry and GPS/satellite transmitters allow both direct management/intervention and long term monitoring. The down listing goal of three disjunct populations with two in the wild and one in captivity all containing at least 150 birds and 15 breeding pairs each may be reached by 2020. Lead poisoning and micro trash ingestion by wild nestlings continue to hinder long-term recovery of this species.

Parrots, islands, cages, and hawks: The evolution of a successful adaptive management strategy
Thomas H. White, Jr.[1], Francisco J. Vilella[2], Jaime A. Collazo[3]. [1]*U.S. Fish and Wildlife Service.* [2]*Mississippi Cooperative Fish and Wildlife Research Unit.* [3]*North Carolina Cooperative Fish and Wildlife Research Unit.*
The current reintroduction program for the critically endangered endemic Puerto Rican parrot (*Amazona vittata*) represents the continual evolution and application of a successful adaptive management strategy developed over the course of 10 years of successive releases of captive-reared parrots both in Puerto Rico (*A. vittata*) and the Dominican Republic (*A. ventralis*). Strategies and techniques are refined based on real-time input from the results of each release event, each of which is critically evaluated to identify the interplay between management practices and environmental factors and how subsequent releases may be modified to increase survival of released parrots and facilitate their rapid adaptation to the release environment. Starting with the application of the surrogate species concept for development of target species methodologies, and culminating in site-specific single species release strategies, the current reintroduction program has resulted in the recent re-establishment of the first free-flying Puerto Rican parrot population outside the Caribbean National Forest, until now home to the sole wild population of the species, in over 60 years. We also discuss how this strategically adaptive process is being applied to develop plans to reintroduce yet a third wild population of Puerto Rican parrots on the island.

Poster Abstract from South Asian region

54. Reintroduction programmes of endangered species in North Madhya Pradesh
R.J. RAO, *School of Studies in Zoology, Jiwaji University, Gwalior, india*

In India under the Crocodile Project, captive reared crocodiles have been both reintroduced in areas where they had been extirpated locally and also used for supplementation of relict populations. The supplementation exercise for crocodiles has been most successful in India.

The Madhya Pradesh State Government has undertaken rehabilitation programme for the highly endangered crocodile species - the gharial under the Crocodile Project that started country-wide during 1975. The important crocodile habitats were identified and given protection by declaring them as sanctuaries. For conservation of crocodiles three sanctuaries have been created in the M.P. They are: 1. National Chambal Sanctuary on Chambal River, 2. Ken Gharial Sanctuary on Ken River and 3. Son Gharial Sanctuary on Son River.

In these sanctuaries management programmes are emphasised for the conservation of the gharial and other animals. Rehabilitation of Gharial has been taken up in the National Chambal Sanctuary from 1978. Around 2000 captive reared gharial have been released in the Chambal River by Madhya Pradesh and Uttar Pradesh Forest Departments. To avoid any possible migration of gharial to outside the Sanctuary area, most of the releases were done in the up-stream of the Chambal River near Pali, Baroli and Rameswar ghat where river Banas joins Chambal River. Captive reared muggers were also released in the Chambal River.

In addition to release of crocodiles in the Chambal River captive reared gharial have also been released in Ken and Son Gharial Sanctuaries of Madhya Pradesh. In the Kuno Palpur Sanctuary (KWS), Madhya Pradesh Asiatic lion are going to be released to provide second home for the species outside the Gir forests in Gujarat.

With a view to prevent the extinction of the Asiatic lions, the KWS in the northwest Madhya Pradesh was selected as the site to establish a second free ranging population of the Asiatic lions. The KWS, is situated in the Sheopur district of Madhya Pradesh. An area of 344.686 sq. km. was set aside as a Sanctuary in 1981 which is already elevated to the Kuno Wildlife Division with an additional area of about 900 sq. km. as a buffer area. After KWS was selected as the site for reintroduction of the Asiatic lion, one of the first tasks was the sensitive job of relocation and proper rehabilitation of 24 villages from within the sanctuary and to create human free environment for the lions. Today the KWS is totally devoid of human pressure with the continuing rehabilitation process.

In all these protected areas management programmes have been taken up by the Madhya Pradesh Forest Department. Large amount of money has been spent for reintroduction of crocodiles and lions and protection of other endangered species like dolphins, bustards etc. In the special reintroduction projects regular assessment of success of the programmes is very much necessary.

Poster Sessions (Title & authors only) at the 1st International Wildlife Reintroduction Conference

Two poster sessions, the first on Tuesday April 15th and the second on Wednesday April 16th, were scheduled during the conference. For full abstracts see www.reintroduction.org.

Poster Session I

1. Worldwide review of reintroduction programs of birds of prey
Roberto Muriel Abad and Miguel Ferrer, *Estacin Biológica de Doñana (CSIC) Avd. Ma Luisa s/n, 41013 Sevilla, SPAIN*

2. Twenty years of Arabian oryx captive-breeding and conservation program in Saudi Arabia
Saud Anajariyya, *National Wildlife Research Center of National Commission for Wildlife Conservation and Development, Saudi Arabia*

3. Endangered and endemic amphibians in a West African rain forest
Annika Hillers, Caleb Ofori Boateng, Alex Cudjoe Agyei, and Mark-Oliver RÖdel, *Kwame Nkrumah University of Science and Technology*

4. Headstarting the Anegada Iguana, *Cyclura pinguis*
Kelly A. Bradley[1] and Glenn P. Gerber[2]. *[1]Dallas Zoo. [2]CRES, Zoological Society of San Diego*

5. Design of a Wildlife Rehabilitation and Release Project Lessons Learned
Robin Brockett, *U Director, Wildlife Care Center of Belize*

6. Monitoring captive and reintroduced populations to support captive-breeding decision-making: island foxes at Channel Islands National Park
Timothy J. Coonan[1] and Catherin A. Schwemm[2]
[1]National Park Service, Channel Islands National Park, 1901 Spinnaker Drive, Ventura, CA 93001, USA
[2]Department of Ecology, Evolution and Marine Biology, University of California, Santa Barbara, CA 93106

7. Comparing wild and captive populations: Genetic implications for maximizing potential reintroduction success
Jaret C. Daniels, Ph.D. and Emily V. Saarinen
University of Florida, Department of Entomology and Nematology, P.O. Box 110620, Gainesville, FL 32611

8. Monitoring Stress and Reproductive Physiology in Reintroduced Canada Lynx
Kerry Fanson[1], Dr. Nadja Wielebnowski[2], Dr. Jeffrey Lucas[1]
[1]Purdue University, Dept. Biological Sciences, 915 W. State St., West Lafayette, IN 47907. [2]Brookfield Zoo, 3300 Golf Rd., Brookfield, IL 60513

9. Captive breeding and release of endemic bird species on islands: what have we learned from the San Clemente loggerhead shrike?
Susan M Farabaugh[1], Tandora Grant[1], James Bradley[2], Jason Fidorra[2]. *[1]CRES, ZSSD, 15600 San Pasqual Valley Rd., Escondido CA 92027-7000. [2]Institute for Wildlife Studies, 2515 Camino Del Rio S., San Diego CA 92108*

10. Modeling the impact of reintroductions on source population dynamics of great apes in African sanctuaries
Lisa Faust[1], Ben Beck[2], Doug Cress[3]. *[1]Alexander Center for Applied Population Biology, Lincoln Park Zoo. [2]Great Ape Trust of Iowa. [3]Pan African Sanctuary Alliance*

11. The San Clemente Loggerhead Shrike Recovery Program: Maximizing Survival Through Experimentation and Adaptation in Release Techniques
Jason Fidorra, Andrew S. Bridges, Susan M. Farabaugh, James E. Bradley and David K. Garcelon, *Institute for Wildlife Studies, 2515 Camino del Rio S., Suite 334, San Diego, CA 92108 USA*

12. Health and welfare in reintroductions: Lessons from small mammals
Merryl Gelling[1], Fiona Mathews[2], Tom Moorhouse[1], David W. Macdonald[1]. *[1]Wildlife Conservation Research Unit, Oxford University, Tubney House, Abingdon Road, Tubney, Oxon, OX13 5QL. [2]School of Biosciences, University of Exeter, Geoffrey Pope Building, Stocker Road, Exeter, EX4 4QD*

13. Passeriformes from the wildlife traffic in the Sao Paulo City: determination of the main causes of death (pathology) and implications of releasing these animals
Silvia Neri Godoy[1] and Eliana Reiko Matushima[2]
[1]IBAMA - SHIN CA 02 Bloco D Apto 408 - Lago Norte - Brasalia -DF - 71503-502 - Brazil. [2]FMVZ-USP

14. Caribbean Iguana Recovery Programs
Tandora Grant, Glenn Gerber, Jeffrey Lemm, Lee Pagni, Allison Alberts, *Conservation and Research for Endangered Species, Zoological Society of San Diego, 15600 San Pasqual Valley Rd., Escondido CA 92027*

15. Detection of potential reintroduction areas for the Mexican gray wolf (*Canis lupus baileyi*) in Mexico
Patricia G. Martínéz Gutiérrez[1], Jorge I. Servín Marínez[2], Enrique Marínez Meyer[1]. [1]Instituto de Biologia, Universidad Nacional Autónoma de México (UNAM) Circuito exterior S/N, Ciudad Universitaria, C.P. 04510, D.F., México [2]Departamento de Desarrollo Sustentable, Instituto de Ciencias Sociales, Universidad Juarez del Estado de Durango (UJED) / Priv. Aquiles SerdÃn y Predio Canoas S/N Col Los Angeles, C.P. 34000, Durango, Durango, México

16. Reintroduction, range expansion, and population development on a continental scale: the beaver's reconquest of Eurasia
D.J. Halley, *Norwegian Institute for Nature Research - NINA, Tungasletta 2, NO-7047 Trondheim, Norway*

17. Behavioural aspects of conservation breeding - Red junglefowl as a case study
Jennie Ha'kansson, *Division of Zoology, Department of Physics, Chemistry and Biology, Linkoping University, SE-581 83 Linköping Sweden.*

18. Thirty years of mortality assessment in whooping crane reintroductions: Patterns and implications
Barry K. Hartup[1], Marilyn G. Spalding[2], Nancy J. Thomas[3], Gretchen A. Cole[4], and Young Jun Kim[5]. *[1]International Crane Foundation, Baraboo, Wisconsin USA. [2]University of*

Florida, Gainseville, USA. [3]USGS National Wildlife Health Center Madison Wisconsin, USA [4]University of Wisconsin, Madison Wisconsin, USA. [5]Seoul National University, Seoul, South Korea

19. Experimental approach in large scale reinforcement programs: implications and constraints
Yves Hingrat, Pierrick Rautureau, and Lacroix Frédéric
Emirates Center for Wildlife Propagation, PoBox 47, 33250, Missour, Morocco

20. Development of disease risk analysis and management protocols for a Steller's eider (Polysticta stelleri) reintroduction plan
Tuula Hollmen, *Alaska SeaLife Center and University of Alaska Fairbanks PO Box 1329, Seward, AK 99664*

21. A Review of Crane Reintroductions Using Isolation Rearing with Puppets and Costumes
Robert H. Horwich, *Community Conservation, 50542 One Quiet Lane, Gays Mills, WI 54631*

22. Conservation challenges to continue the reintroduction of houbara bustard Chlamydotis macqueenii in the Kingdom of Saudi Arabia
M. Zafar-ul Islam, Mohammed Basheer P., Moayyad Sher Shah, Hajid al-Subai, Ahmed Boug, *National Wildlife Research Centre, P.O. Box 1086, Taif, Kingdom of Saudi Arabia*

23. Informal and formal planning for reintroduction: when, how, who and why
Ignacio Jiménez-Pérez, *The Conservation Land Trust Argentina Cuba 3129, Dto.15, Capital Federal, 1429, Argentina*

24. A review of the worlds seabird reintroduction projects
Holly Jones, *Yale University School of Forestry & Environmental Studies, 370 Prospect St., Greeley Lab, New Haven, CT 06511*

25. Social group fission and the formation of new groups after translocation of Golden Lion Tamarins (*Leontopithecus rosalia*), Brazil.
Maria Cecilia Maritins Kierulff, Paula Procópio de Oliveira, Marina Janzantti Lapenta, *Fundação Parque Zoolgico de São Paulo*

26. A multidisciplinary approach to western gorilla reintroduction and ecosystem restoration in Congo and Gabon
Tony King, *The Aspinall Foundation, Port Lympne Wild Animal Park, nr Hythe, Kent CT21 4PD, UK*

27. Genetic diversity: a key-factor in the success of reintroduced populations of the common hamster (*Cricetus cricetus*) in the Netherlands?
Maurice La Haye[1] and Harald Schmidt[2]. *[1]Radboud University Nijmegen, Dept. of Animal Ecology, PO Box 9010, 6500 GL Nijmegen, The Netherlands. [2]Rotterdam Zoo, PO Box 532, 3000 AM Rotterdam, The Netherlands*

28. Captive breeding for species recovery in Western Australia
Cathy Lambert[1], Keith Morris[2] and Dani Jose[1]
[1]Perth Zoo, PO Box 489, South Perth, Western Australia 6951, Australia. [2]Science Division, Wildlife Research Centre, Department for Environment and Conservation, PO Box 51, Wanneroo, Western Australia, 6946, Australia

29. The Norwegian Arctic Fox captive breeding programme - History and status
Arild Landa, Eide, N.E., Flagstad, Dijk, J. van, Strand, O., & Linnell, J.D.C., *Norwegian institute for nature research, NO 7485, Trondheim*

30. Integrating dispersal in metapopulation viability analysis: the case of Griffon vulture (*Gyps fulvus*) in France.
P. Le Gouar[1,2], A. Robert1, JB Mihoub[1], F. Sarrazin[1]
[1]UMR 5173 MNHN-CNRS-UPMC, Conservation des Espéces, Restauration et Suivi des Populations, 61 rue Buffon, 1er étage, 75005 Paris, France. [2]UMR 6553 Universit Rennes1-CNRS, Ecobio, Station biologique de Paimpont, bat A p111, 35380 Paimpont, France

31. Reintroduction of the European Mink *Mustela lutreola* (Linn 1761) in the nature reserve "Täler der ILL und ihre Nebenbäche" Saarland, Germany
Krüger Frauke, Zwirlein Silke, Müler Ina, Brinkmann Ilona, Peters Elisabeth, *University of Osnabrueck, Departement of Ethology, Barbarastr 11, 49076 Osnabrueck, Germany*

32. The Wattled Crane Recovery Programme
Jeanne Marie Pittman[1], CVT, *[1]Johannesburg Zoo, Private Bag x 13, Parkview 2122, Johannesburg, South Africa*

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41. Active conservation of Spanish Imperial Eagle (*Aquila adalberti*) and Osprey (*Pandion haliaetus*) in Andalusia (Spain): reintroduction and restocking programs
Eva Casado, Roberto Muriel, Miguel Ferrer
Department of Biodiversity Conservation, Estacion Biologica de Doñana (CSIC), Avda. Maria Luisa s/n, Pabellon del Peru, 41013 Sevilla, Spain

42. Genetic management of reinforcement programs: the case of Houbara Bustards
Lesobre[1], Lacroix[2], Saint Jalme[1]
[1]MNHN CNRS Paris VI Managerie du Jardin des Plantes, 57 rue Cuvier 75005 Paris, France. [2]Emirates Centre for Wildlife Propagation, Po Box 47, Province de Boulemane, 33250 Missour, Royaume du Marocco

43. American founders in Europe
Arne Ludwig[1], Ursula Arndt[2], Tim King[3], Shuichi Matsumura[4]. *[1]Leibniz Institute for Zoo and Wildlife Research, Evolutionary Genetics, 12561 Berlin, Germany. [2]Simon Fraser University, Department for Archaeology, Burnaby, BC, Canada. [3]United States Geological Survey, Leetown Science Center, 11649 Leetown Road, Kearneysville, West Virginia, 25430, USA. [4]Leibniz-Institute of Freshwater Ecology and Inland Fisheries, 12567 Berlin, Germany, 6International Institute for Applied Systems Analysis, A2361 Laxenburg, Austria*

44. Avian Reintroduction Programs Designed for Evolving Environments
Michael Mace[1] and Alan Lieberman[2]. *[1]San Diego Zoo's Wild Animal Park, 15500 San Pasqual Valley Rd., Escondido, CA 92027. [2]Zoological Society of San Diego, 15600 San Pasqual Valley Rd., Escondido, CA 92027*

45. Captive Breeding and Reintroduction of the Vancouver Island marmot (*Marmota vancouverensis*)
Malcolm McAdie, *Marmot Recovery Foundation*

46. Dealing with reproductive habitat selection of released individuals in reintroduction establishment phases: a theoretical modeling approach

JB Mihoub[1], P. Le Gouar[1,2] and F. Sarrazin[1]. [1]*UMR 5173 MNHN-CNRS-UPMC, Conservation des Especes, Restauration et Suivi des Populations, 61 rue Buffon, 1er étage, 75005 Paris, France.* [2]*UMR 6553 Universite Rennes1-CNRS, Ecobio, Station biologique de Paimpont, bat A p111, 35380 Paimpont, France*

47. Long-term consequences of inbreeding for a translocated reptile population

Kimberly A. Miller[1], Nicola J. Nelson[1], David R. Towns[2] [1]*School of Biological Sciences, Victoria University of Wellington, PO Box 600, Wellington, New Zealand.* [2]*Science and Research Unit, Department of Conservation, Private Bag 68 908, Auckland, New Zealand*

48. An assessment of two methods used to release Red Kites *Milvus milvus* to Hampshire, England.

Campbell Murn and Samuel Hunt, *The Hawk Conservancy Trust, Andover, Hampshire, SP11 8DY, England*

49. Field Propagation and Release of a Migratory Passerine: success through adaptive management

Rina Nichols[1], Jessica Steiner[1], Lance Woolaver[1], Ken Tuininga[2]. *1Wildlife Preservation Canada, 5420 Highway 6 North, Guelph, Ontario, Canada, N1H6J2.* [2]*Environment Canada, 4905 Dufferin Street, Toronto, Ontario, Canada, M3H5T4*

50. A Fourteen Year Cooperative Effort to Re-Establish the Endangered American Burying Beetle to Nantucket Island, Massachusetts Begins to Show Promise

Andrew Mckenna-Foster[1], Lou Perrotti[2], Michael Amaral[3] [1]*Maria Mitchell Association.* [2]*Roger Williams Park zoo 1000 Elmwood ave providence RI 02905.* [3]*United States Fish and Wildlife Service*

51. Translocation of Blue-and-yellow macaws to Nariva Swamp, Trinidad.

Bernadette Plair[1], Kristine Kuchinski, DVM[2], Joseph Ryan, DVM[3], David Boodoo[4]. [1]*Cincinnati Zoo & Botanical Garden, 3400 Vine Street, Cincinnati, Ohio 45220.* [2]*Florida Avian Advisors, Gainsville, Florida.* [3]*Ministry of Food Production & Marine Resources, Port-of-Spain, Trinidad.* [4]*Wildlife Section, Forestry Division, Ministry fo Environment, St. Joseph, Trinidad.*

52. Evaluating the Demographic Factors that Affect the Success of Reintroducing Fishers (*Martes pennanti*) and the Effect of Removals on a Source Population

Roger A. Powell[1] and Jeffrey C. Lewis[2]. [1]*Department of Zoology, North Carolina State University.* [2]*Washington Department of Fish & Wildlife*

53. The habitat use of released captive-reared gray partridges (*Perdix perdix*) and its effect on reintroduction success

Rantanen, E.[1], P. Riordan[1], F. Buner[2], and D. Macdonald[1] [1]*Wildlife Conservation Research Unit, University of Oxford, United Kingdom.* [2]*Game and Wildlife Conservation Trust, Forgingbridge, United Kingdom*

54. Reintroduction programmes of endangered species in North Madhya Pradesh

R.J. Rao, *School of Studies in Zoology, Jiwaji University, Gwalior, India*

55. The Fall & Rise of Pateke: Saving one of the World's Rarest Ducks

Kevin Evans, *Pateke Captive Coordinator, Pateke Recovery Group, Department of Conservation, New Zealand*

56. Measuring success: lessons learned from the Puaiohi (*Myadestes palmeri*)

Pauline Roberts[1], Alan Lieberman[2], David Leonard[3] [1]*Kauai Forest Bird Recovery Project, Hawaii Kauai Forest Bird Recovery Project, Hawaii Department of Land and Natural Resources, Division of Forestry and Wildlife, P.O. Box 458, Waimea, HI 96796.* [2]*Zoological Society of San Diego, Conservation and Research for Endangered Species, 15600 San Pasqual Valley Road, Escondido, CA 92027.* [3]*Hawaii Department of Land and Natural Resources*

57. Adaptive management and measures of success on an Eurasian Otter (*Lutra lutra*) reintroduction in Catalonia (NE Spain)

Deli Saavedra, *Territory and Landscape Foundation*

58. Spotted salamander (*Ambystoma maculatum*) reintroduction in restored flatwoods wetlands in Lake County, Illinois.

Allison B. Sacerdote, *Northern Illinois University Department of Biological Sciences 430 Montgomery Hall DeKalb, IL 60115*

59. Voices of the Past: Historical DNA as a Tool in Developing Reintroduction and Translocaiton Programs

Kari Schmidt, *Institute for Comparative Genomics, American Museum of Natural History, Central Park West 79th Street, New York, NY 10024*

60. Bilbies in Eden

Colleen Sims, Nicole Noakes, Kathryn Himbeck *Western Australian Department of Environment and Conservation Shark Bay District, 89 Knight Tce, Denham, Western Australia, 6537*

61. Demographic and genetic implications following translocation of Northern bobwhites to an isolated, fragmented habitat

Theron M. Terhune[1], Brant C. Faircloth[1,3], D. Clay Sisson[2], William E. Palmer[3], H. Lee Stribling[3,4] and John P. Carroll[1] [1]*D.B. Warnell School of Forestry and Natural Resources, University of Georgia, Athens, GA 30602, USA.* [2]*Albany Quail Project, c/o Pineland Plantation, Route 1 Box 115, Newton, GA 39872, USA.* [3]*Tall Timbers Research Station, 13093 Henry Beadel Drive, Tallahassee, FL 32312, USA.* [4]*School of Forestry and Wildlife Sciences, 602 Duncan Drive, AL 36849, USA*

62. Selection of release sites and the mitigating causes of the decline of the Southern Ground Hornbill in South Africa

Ann Turner, *The Ground Hornbill Project, Mabula Game Reserve, Private Bag X1644, Bela Bela 0480, Limpopo*

63. Veterinary Requirements of Great Ape Release

Steve Unwin[1], Dominic Travis[2], Marc Ancrenaz[3], David Lucas[4]. [1]*Chester Zoo, UK.* [2]*Lincoln Park Zoo, Chicago, IL USA.* [3]*K Kinabangtan Orang utan Conservation Project, Malaysia.* [4]*Pan African Sanctuary Allinace, USA*

64. A backwards approach- from species reintroduction to habitat preservation

Chris Walzer[1], Petra Kaczensky[1], Oogii Ganbaatar[2], Christian Stauffer[3]. [1]*Research Institute of Wildlife Ecology, University of Veterinary Medicine, Savoyenstrasse 1, 1160 Vienna, Austria.* [2]*Takhin Tal, Gobi B National Park, Mongolia.* [3]*International Takhi Group, Beatenplatz 2, 8023 Zurich, Switzerland*

65. Climate change impact considerations for reintroduction programmes
Paul Pearce-Kelly and Aylin McNamara, *Climate Change Impacts Group, Zoological Society of London*

66. Monitoring the endangered eastern barred bandicoot: evaluation and modification of a protocol
Amy Winnard, *Department of Zoology, University of Melbourne, VIC 3010, Australia*

67. A method for detecting remnant natives in reintroduced populations
Samantha M. Wisely[1], Sara A. Mueting[2], William E. Van Pelt[3]. [1]*Division of Biology, 116 Ackert Hall, Kansas State University, Manhattan, Kansas 66506 USA.* [2]*Department of Occupational and Environmental Health, 4505 S. Maryland Parkway, University of Nevada Las Vegas, Nevada 89154 USA.* [3]*Arizona Game and Fish Department, 2221 W. Greenway Rd., Phoenix, Arizona 85023 USA*

68. Quantifying species decline and extinction from historic anecdote: a UK perspective on reintroductions
Tom Worthington[1], Paul Kemp[1], Patrick Osborne[1], Keith Easton[2]. [1]*Centre for Environmental Sciences, School of Civil Engineering and the Environment, University of Southampton, SO17 1BJ, UK.* [2]*Environment Agency, Trentside Offices, Scarrington Road, West Bridgford, Notts, NG2 5FA, UK*

69. Conservation of European bisons (*Bison bonasus bonasus*): Poloniny reintroduction project.
Cesare Avesani Zaborra, Caterina Spiezio and Donata Grassi, *Research Department, Parco Natura Viva - Garda Zoological Park*

70. Flight of Hope: Teaching rare Siberian Cranes to migrate.
Alexander Sorokin[1], Anastassia Shilina[1], George Achibald[2] and Claire Mirande[2]. [1]*All Russian Research Institute for Nature Protection.* [2]*International Crane Foundation*

71. Houbara Bustard life history parameters. Released vs. recipient population: evaluation of reinforcement success.
Rautureau Pierrick, Hingrat Yves and Lacroix Frédéric *Emirates Center for Wildlife Propagation*

72. Reintroduction of hand-reared orphan Greater One-Horned Rhinoceros to Manas National Park, Assam, India: Opportunities and challenges.
Rathin Barman[1], Anjan Talukdar[1], Murali Pai[2], Bhaskar Choudhury[1], NVK Ashraf[1], Vivek Menon[1], Anand Ramanathan[3]. [1]*Wildlife Trust of India,* [2]*Clemson University.* [3]*International Fund for Animal Welfare*

Poster Abstract from South Asian region

72. Reintroduction of hand-reared orphan Asian Greater One-Horned Rhinoceros to Manas National Park, Assam, India: Opportunities and challenges

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The endangered one-horned rhinoceros *{Rhinoceros unicornis)* has disappeared from most of its original distribution range in the Indian subcontinent. The species is now restricted to certain pockets in India and Nepal where they are rigorously protected by the respective state and central governments. In the state of Assam, the species is confined to three Protected Areas namely the Kaziranga National Park, Pabitora and Orang Wildlife Sanctuaries. While a sizeable rhino population thrived in the Manas National Park of Assam in India, decades of political unrest and poaching left the park bereft of its 100 odd rhinos. With the return of normalcy after political autonomy to local communities, Wildlife Trust of India, in partnership with the International Fund for Animal Welfare and in collaboration with the Assam Forest Department, relocated three female orphaned rhinos rescued from Kaziranga to Manas. This milestone in wildlife conservation in India heralds the beginning of the return of the rhino to the Manas world heritage site. The rhino calves, rescued during the annual floods in Kaziranga National Park in different years, were hand-reared for over three years at the Centre for Wildlife Rehabilitation and Conservation (CWRC), established in 2002 for rehabilitation of displaced wildlife especially rhinos. The rhino calves were radio-collared and moved to Manas National Park after the hand-rearing process at two different times, in 2006 and 2007. They will be released after two year period of *in-situ* acclimatization in a 15 acre soft release enclosure. This presentation attempts to showcase the field-rescue of the three rhino calves during floods in Kaziranga, their hand-rearing, health care and management at CWRC and their relocation to Manas after site selection. In addition, we discuss the habitat protection initiatives in place and demonstrate the importance of hand-reared orphan rhino claves in restocking and re-introduction efforts of endangered species.