International Journal of Innovative Research in Computer Science & Technology (IJIRCST)
ISSN: 2347-5552, Volume-10, Special Issue-2, February-2022
Young Researchers' Conference on Indian Literatures, 2022
Organized by Presidency University, Bangalore, India

Rare Species Breeding and Reintroduction

Dr. Krishnappa Venkatesharaju
Assistant Professor, Department of Environmental Science And Engineering, Presidency University, Bangalore, India,
Email Id-venkateshraju.k@presidencyuniversity.in

ABSTRACT:
The term species re-introduction refers to the process of re-establishing a plant or animal in a region that was formerly a part of its historical range but from which it has since been eradicated or extinct. The term species re-establishment, which is a synonym, typically denotes the success of the reintroduction. Translocation refers to the intentional and supervised movement of wild individuals or populations from one region of their distribution to another. An increase in population is referred to as reinforcement or supplementation. The technique of establishing a species outside of its recorded distribution but in a suitable habitat and eco-geographical area is known as benign introduction, which is done for conservation purposes.

KEYWORDS:

Botanic Gardens, Breeding Reintroduction, Captive Breeding, Endangered Species, Genetic Diversity.

I. INTRODUCTION

The process of establishing a plant or animal in a region that was formerly a part of its historical range but from which it has been eradicated or gone extinct is known as species re-introduction. A synonym that typically indicates that the reintroduction was successful is species re-establishment. The planned and managed transportation of wild individuals or populations from one area of their distribution to another is referred to as translocation. The addition of people to an existing population is referred to as reinforcement or supplementation. The term benign introduction refers to the process of establishing a species for conservation purposes outside of its recorded distribution but in a suitable habitat and eco-geographical location. Zoos, aquariums, marine parks, insect houses, and botanical gardens all have a part to play in the captive breeding of plants and animals to create stocks for reintroductions, whether they do it themselves or just offer advice and assistance. Across 500,000 animals are thought to be kept in captivity in zoos across the world.

However, it is generally accepted that minimal human touch must be used during captive breeding in order to achieve the optimum results. Over the next few decades, population increase, deforestation, habitat loss, damaging development, and agricultural expansion will jeopardize the survival of up to 60,000 plant species, or nearly a quarter of the total in the globe. The sheer scale of plant degradation poses a threat to human survival. Numerous wild plants, in addition to the few crop plants we depend on for our daily needs, are also of tremendous economic significance since they give hundreds of millions of people throughout the world access to food, fuel, clothing, and shelter. Additionally, plants provide medication, particularly in poor nations where a large number of people rely on wild herbs for their traditional cures. Additionally, plants provide habitats for the world's animal life and support the environmental harmony and ecosystem stability of the globe.

Plantation Gardens

A botanical garden in Java, Indonesia called Cibola's Around 1,600 botanic gardens exist worldwide. They cultivate tens of thousands of different plant species; their collections likely contain up to 25% of the world's ferns and flowering plants. Numerous botanic gardens have been inspired to develop into significant conservation hubs because to the global increase in the rate at which plant variety and wild habitats are being lost. Botanic gardens are sometimes the only or top organizations in many nations capable of conducting considerable research on and protection of wild plant life. In order to serve as hubs for plant conservation, study, and education, particularly of plants indigenous to their respective regions, many new botanic gardens are being constructed or created. Public gardens that maintain collections of living plants primarily for study, scientific research, conservation, or education are known as botanic gardens. Botanic gardens come in a variety of sizes and shapes.

Botanic gardens share the conviction that they have a vital role to play in protecting the diversity of plants in the globe, despite the vast differences in their size and resources. In order to preserve them in case wild populations are wiped out, botanical gardens cultivate sizable collections of endangered species. Plants are returned to the

wild as a part of programmes for species recovery. They do botanical study to catalogue and catalogue the world's flora and their characteristics. For instance, their dried plant collections house millions of specimens as a constant resource for the diversity of plants around the world. Through their efforts in education, they encourage public understanding of the environment. Botanic gardens draw more than 150 million visitors annually from all around the world. They are professional training and horticulture facilities; a plant's ability to survive in the future may depend on its ability to grow [1], [2].

Zoos and other Reproductive Facilities

Creating founder populations for reintroduction programmes into the wild is a common goal of many captive breeding programmes carried out in zoological parks. Few zoos have the expertise to manage captive populations seriously, yet this is a scenario that is increasingly changing. Species management has been simpler because to new technology, such as molecular and DNA analysis, which also aids scientists in avoiding potential mistakes. For instance, mapping genealogical data also reduces inbreeding. The International Union for the Conservation of Nature and Natural Resources' (IUCN) Re-introduction Specialist Group has developed policy guidelines in response to the rising number of re-introduction projects around the world and the resulting increase in the demand for specific policy guidelines to help ensure that the re-introductions achieve their intended conservation benefit and do not have negative side-effects with greater impact. These rules aren't a rigid code of behavior; rather, they're meant to serve as a manual for processes helpful to reintroduction programmes. In comparison to translocations of wild species, many of the considerations are more pertinent to reintroductions utilizing captive-bred individuals. Others are particularly pertinent to globally threatened species with few founders. Every reintroduction plan needs to be carefully examined on its own merits. Re-introduction is always a very drawn-out, difficult, and expensive procedure, it should be mentioned. The recommendations were used to create the parts that follow, which show how ecological knowledge must be included with reintroduction.

Targets and Goals

Any reintroduction should have as its main goal the establishment of a healthy, free-ranging population of a species, subspecies, or race that has been locally or globally extinct, or extirpated, in the wild. It should be reintroduced within the former habitat and range of the species and should only necessitate short-term maintenance. A reintroduction's goals may be to increase a species' long-term survival, re-establish a keystone species in an ecosystem in an ecological or cultural sense, maintain and restore natural biodiversity, bring long-term economic benefits to the local and national economy, raise awareness of conservation issues, or a combination of these. Re-introductions necessitate a multidisciplinary strategy and a team of individuals with diverse backgrounds [3], [4].

II. DISCUSSION

Along with employees of the government, these individuals could be from governmental groups in charge of managing natural resources, non-governmental organizations, funding organizations, universities, veterinary hospitals, zoos (and private animal breeders), and/or botanic gardens, depending on their level of knowledge. Coordination between the various organizations should be the responsibility of the team leaders, and plans should be created for publicity and public awareness of the initiative.

Biological

A Feasibility Study and Preparatory Work

The taxonomic standing of the people who will be reintroduced needs to be evaluated. Unless sufficient numbers are not available, they should ideally be of the same subspecies or race as those that were extirpated. If there is any dispute regarding an individual's taxonomic status, research into historical records of the disappearance and fate of those individuals from the re-introduction location, as well as molecular genetic analyses, should be conducted. It can be useful to research genetic diversity within and between populations of this and related taxa. When the populace has long since vanished, special attention is required. To ascertain the crucial requirements of the species, thorough studies of the status and biology of wild populations should be conducted. In the case of animals, this would include descriptions of habitat preferences, intraspecific variation, and adaptations to regional ecological conditions, as well as social behavior, group composition, the size of home ranges, food and shelter needs, foraging and eating habits, predators, and diseases. Studies on migratory animals should take into account prospective migratory locations.

For plants, this would include the need for both biotic and abiotic habitats, as well as the dispersal mechanisms, biology of reproduction, symbiotic interactions such as those with mycorrhizae and pollinators, insect pests, and

diseases. Overall, the success of the overall reintroduction plan depends on having a thorough understanding of the natural history of the targeted species. It is crucial to identify the species, if any, that has stepped in to fill the hole left by the loss of the relevant species. The success of the reintroduced population will depend on how the introduced species will affect the ecosystem. In order to determine the ideal number and makeup of individuals to be released each year as well as the amount of years required to encourage development of a viable population, the build-up of the released population should be modelled under several sets of conditions. The identification of relevant environmental and population variables and the evaluation of potential interactions between them will be aided by a population and habitat viability analysis, which will serve as a guide for long-term population management.

Reintroductions from the Past

Prior to and during the development of the re-introduction process, in-depth study of previous re-introductions of the same or comparable species and extensive contact with people with relevant experience should be made.

Site and Method of Release

Site should be within the species' historical range. There should be only a few remaining wild individuals for the initial reinforcement. There should not be a remnant population for a reintroduction in order to stop the spread of disease, disruption of social order, and introduction of foreign genes. It may be necessary in some cases to reintroduce or reinforce an area that has been fenced off or otherwise defined, but it must be done within the former habitat and range of the species. When there are no prospects for reintroduction into the native site or range and when the species will significantly benefit from it, a conservation/benevolent introduction should only be carried out as a last resort. There should be reliable, long-term protection for the reintroduction area whether formally or informally.

Evaluation of the Reintroduction Site

Reintroductions shouldn't take place unless the habitat and landscape needs of the species are met and are expected to endure for the foreseeable future. One must take into account the potential for natural habitat alteration following extirpation. The legal, political, or cultural environment has changed since a species went extinct, and this shift needs to be determined and assessed as a potential limitation. The region should have enough carrying capacity to support long-term viability of the reintroduced population as well as its growth. Identification and elimination, or reduction to an adequate level, of prior causes of decline, such as disease, excessive hunting, excessive collecting, pollution, poisoning, competition with or predation by introduced species, habitat loss, negative effects of prior research or management initiatives, and seasonal competition with domestic livestock. Before carrying out the reintroduction, a habitat restoration effort should be started if the release location has undergone significant deterioration as a result of human activities [5], [6].

The Accessibility of Appropriate Release Stock

It is ideal for source animals to come from populations of wild animals. The source population should ideally exhibit similar ecological traits morphology, physiology, behavior, and habitat preference to the original sub-population and be closely related genetically to the original native stock if there is a choice of wild populations to supply founder stock for translocation. The captive stock population or the wild source population cannot be endangered by the removal of individuals for reintroduction. Stock must be guaranteed to be accessible on a regular and predictable basis and adhere to project protocol requirements. Only once the donor population's impacts on the translocation have been evaluated and it is certain that these effects won't be detrimental may individuals be taken from a wild population. If captive or artificially produced stock is to be used, it must come from a population that has undergone sound demographic and genetic management in accordance with modern conservation biology principles.

Reintroductions shouldn't be done just because captive stocks exist or just as a way to get rid of extra stock. Prior to shipment from the originating source, prospective release stock including stock that is a gift between governments must undergo a rigorous veterinary screening procedure. The uninfected, negative rest of the consignment must be held in strict confinement for a reasonable amount of time before retesting, and any animals discovered to be infected or that test positive for non-endemic or infectious infections having a possible influence on population levels, must be removed from the consignment. The animals may be ready for shipment if the results of the retesting are clear. Great care must be taken to reduce the risk of infection with deadly diseases during shipment, especially if it is across international borders. The recipient country's veterinary authorities' health rules must be followed by the stock, and if necessary, suitable measures must be made for quarantine.

Release of Captive Stock

Most mammal and bird species rely heavily on individual experience and learning during their formative years in order to survive; therefore, captive-bred individuals should be given the chance to learn the skills required for survival in the wild through training in their environment; their chances of surviving should be similar to those of their wild counterparts. It is important to take precautions to make sure that potentially dangerous captive-bred animals such large carnivores or monkeys are not overconfident in human presence and endanger local residents and/or their livestock.

Legal and Socio-Economic

Re-introductions are typically lengthy initiatives that call for long-term financial and political commitment. Socioeconomic research should be done to evaluate the reintroduction program's effects, costs, and advantages on the local human population. To ensure the long-term protection of the reintroduced population, a detailed evaluation of local residents' views towards the proposed project is required, particularly if human factors such as excessive hunting, excessive collecting, habitat loss, or change were the cause of the species' decline. Local communities need to thoroughly comprehend, embrace, and support the plan. When human activities endanger the safety of the reintroduced population, steps should be taken to reduce them in the reintroduction region. If these steps are insufficient, the reintroduction should be stopped and alternate release sites should be looked for.

It is important to evaluate the nation's stance on reintroductions and the relevant species. This may entail reviewing current local, state, federal, and international laws and regulations, as well as implementing new measures and obtaining essential permits as needed. Reintroduction must occur with the consent and active participation of all pertinent government authorities in the recipient or host nation. This is crucial when populations are being reintroduced in border regions, when more than one state is involved, or when they have the potential to spread to other states, provinces, or territories. If the species poses a harm to property or human life, that risk should be reduced, and if necessary, suitable compensation should be provided. If all other measures fail, the released individual should be removed or destroyed. Provisions should be provided for crossing international/state boundaries in the case of migratory animals [7], [8].

The Steps of Preparation, Planning, and Release

Conjunction with national and international conservation organizations, as well as approval from pertinent government authorities and landowners. Assembling a multidisciplinary team with access to technical advice from experts for each stage of the Programme. Within the framework of agreed-upon targets and objectives, identification of short- and long-term success indicators and Programme length prediction. Securing sufficient financing for each stage of the initiative. Pre- and post-release monitoring programmes should be created so that each reintroduction is a well-planned experiment with the potential to verify methodology using data that has been gathered using scientific methods. Monitoring people's health as well as their survival is crucial if the situation develops in an unanticipated advantageous way, intervention may be required. Appropriate health and genetic testing on all stock before release, even stock given as a gift between governments. In the reintroduction area, closely similar species are being health-screened.

When wild animals are used for release stock, special precautions must be taken to guarantee that the animals are not exposed to disease vectors that may be present at the release site and absent at the source site and to which they may not have developed immunity. If vaccination against local endemic or epidemic illnesses of wild stock or domestic cattle is deemed necessary before release, it must be done during the Preparation Stage to enable enough time for the required immunity to develop. Appropriate veterinary or horticultural measures as necessary to maintain the programs released stock's health. In particular, where founder stock travels distance or crosses international borders to the release site, sufficient quarantine precautions must be made. Development of transportation strategies for getting the stock to the country and site of reintroduction, with a focus on reducing the burden on the people during transportation. Determining the release plan, comprising the stock's adaptation to the release region, behavioral training including hunting and eating, group size and composition, releasing tactics, and timing. Establishing intervention policies. Public relations through the media and in the local community; development of conservation education for long-term support; participation of locals in the Programme, if possible. Throughout all of these phases, the wellbeing of the animals intended for release is of utmost importance.

Activities After Release

All or a sample of individuals are required to undergo post-release monitoring. This crucial issue can be addressed via direct like tagging or telemetry or indirect like spoor or informants means, depending on the situation.

1. It is necessary to conduct demographic, ecological, and behavioral research on the released stock.
2. Study of population and individual long-term adaption mechanisms.
3. Gathering and research of fatalities.
4. When necessary, interventions such additional food, veterinary assistance, or horticultural assistance.
5. Decisions regarding the program's revision, rescheduling, or termination when necessary.
6. Where necessary, habitat protection or restoration should continue.
7. Ongoing public relations initiatives, such as media coverage and education.
8. Analysis of the success and cost-effectiveness of reintroduction approaches.
9. Published in popular and scientific press on a regular basis.

Application

Here are some important uses for breeding and reintroducing endangered species:

1. Programmes for breeding and reintroducing rare species are essential for restoring populations that have suffered severe decreases. Conservationists can increase the number of individuals and establish thriving populations that can be reintroduced into the wild by breeding individuals in controlled circumstances. This aids in preventing additional population decreases, boosting genetic variety, and reestablishing self-sustaining populations in their natural settings.
2. Breeding and reintroduction of endangered animals frequently coincide with efforts to restore their habitat. It is crucial to make sure that there are adequate habitats available for reintroduced individuals to survive. Rehabilitating habitats, eradicating invasive species, and creating hospitable environments for reintroduced species are some examples of restoration actions. This guarantees that individuals that have been reintroduced have the resources and ecological interactions they need to thrive and procreate.
3. Rare species breeding and reintroduction programmes can be used to reestablish species in regions where they have gone locally extinct. This is crucial for species that are essential to ecosystem functioning or have substantial cultural or ecological significance. Such species can be reintroduced to assist restore ecological processes, improve biodiversity, and benefit other organisms and their environments.
4. Programmes for breeding and reintroducing rare species frequently include genetic management techniques to preserve or enhance genetic diversity. By preventing inbreeding and maintaining healthy populations with a variety of genetic backgrounds, captive breeding programmes can aid in the preservation of genetic diversity. To guarantee that reintroduced individuals contribute to the general genetic health and adaptation of the species, genetic analyses and monitoring are carried out.
5. Programmes for the breeding and reintroduction of rare species offer chances for public engagement, awareness, and education. Collaborations with local communities, conservationist groups, and zoos are frequent features of these programmes. Public outreach initiatives including interpretive exhibits, educational programmes, and guided tours aid in spreading knowledge of the value of biodiversity conservation and the difficulties faced by rare and endangered species.
6. Programmes for breeding and reintroducing rare species necessitate cooperation between a variety of stakeholders, including scientists, conservation groups, governmental organizations, and local communities. These cooperative initiatives enable the exchange of information, resources, and expertise, resulting in more effective conservation methods and boosted support for the preservation of endangered species.

Advantages:

The following are some major benefits of breeding and reintroducing uncommon species:

1. **Genetic diversity conservation:** Because of inbreeding and tiny population levels, rare species frequently experience decreasing genetic variety. By carefully controlling breeding partners and preserving strong genetic lineages, breeding programmes can contribute to the preservation and enhancement of genetic diversity. Reintroducing people from different genetic backgrounds into the wild can increase a population's overall genetic health and resistance to environmental stresses. Programmes for the breeding and reintroduction of rare species aid in the population recovery of endangered or vulnerable species. Conservationists can generate more individuals that can be reintroduced into the wild

by breeding individuals in controlled circumstances. This lowers the risk of extinction by assisting in the recovery and stabilization of falling populations [9], [10].

2. **Restoration of Habitat and Species Reintroduction:** Programmes for breeding and reintroducing endangered species frequently work in tandem with efforts to restore their habitat. In locations where they have gone locally extinct, reintroducing individuals into restored or protected habitats aids in population reestablishment. This improves biodiversity, aids in the restoration of ecological processes, and promotes the balance and functionality of ecosystems.
3. **Ecosystem Services:** In ecosystems, rare species often act as keystone species or as gauges of the health of the ecosystem. Reintroducing them can benefit the ecosystem as a whole in a variety of ways. An ecological equilibrium can be restored, for instance, by reintroducing a predator species to assist regulate prey populations. We can aid in the restoration and maintenance of ecosystem functions like pollination, seed distribution, and nutrient cycling by reintroducing uncommon species.
4. **Programmes for the Breeding:** Programmes for the breeding and reintroduction of endangered animals offer chances for public involvement and education. To spread the word about the value of biodiversity protection, these programmes frequently work with zoos, conservation groups, and local communities. Reintroduction initiatives can act as flagship programmes, drawing attention to them, garnering support from the public, and instilling a sense of obligation to protect animals.
5. **Collaborative Conservation Efforts:** Programmes for breeding and reintroducing rare species sometimes call for cooperation between researchers, conservation groups, governmental organizations, and local populations. Programmes for the breeding and reintroduction of rare species offer important opportunities for scientific research and education. Data collection on behavior, reproductive success, and habitat use is aided by observation of the released individuals and their progeny.

III. CONCLUSION

The term benign introduction refers to the process of establishing a species for conservation purposes outside of its recorded distribution but in a suitable habitat and eco-geographical location. Zoos, aquariums, marine parks, insect houses, and botanical gardens all have a part to play in the captive breeding of plants and animals to create stocks for reintroductions, whether they do it themselves or just offer advice and assistance. Across 500,000 animals are thought to be kept in captivity in zoos across the world. However, it is generally accepted that minimal human touch must be used during captive breeding in order to achieve the optimum results. Over the next few decades, population increase, deforestation, habitat loss, damaging development, and agricultural expansion will jeopardize the survival of up to 60,000 plant species, or nearly a quarter of the total in the globe. The sheer scale of plant degradation poses a threat to human survival.

REFERENCES

[1] G. L. D'Alterio, C. Barichievy, and W. Macasero, "Hematology RIs for captive and wild Arabian Sand Gazelles (Gazella subgutturosa marica) of the Kingdom of Saudi Arabia," Vet. Clin. Pathol., 2018, doi: 10.1111/vcp.12600.

[2] F. E. Buderman, M. B. Hooten, J. S. Ivan, and T. M. Shenk, "Large-scale movement behavior in a reintroduced predator population," Ecography (Cop.)., 2018, doi: 10.1111/ecog.03030.

[3] C. J. Price, A. Morris, G. Staines, R. Payne, and J. Smith, "Leaving home but nowhere to go: Lessons learnt from almost two decades of Bush Stone-curlew Burhinus grallarius monitoring on the Central Coast of NSW," Aust. Zool., 2018, doi: 10.7882/AZ.2018.049.

[4] F. de Barros and A. R. Tavares, "Importance of living plants collections," Ornam. Hortic., 2018.

[5] J. R. Rohr, E. S. Bernhardt, M. W. Cadotte, and W. H. Clements, "The ecology and economics of restoration: When, what, where, and how to restore ecosystems," Ecol. Soc., 2018, doi: 10.5751/ES-09876-230215.

[6] L. Rehackova et al., "Qualitative evaluation of a weight loss intervention using total diet replacement (TDR) for diabetes reversal in the Diabetes REmission Clinical Trial (DiRECT)," Diabet. Med., 2018.

[7] S. M. A. W. K. Arif, "Legal Perspectives On Socio-Economic Status Of Women In Azad Jammu And Kashmir," J. Din. Huk., 2018, doi: 10.20884/1.jdh.2018.18.2.1902.

[8] S. Wessendorf, "Pathways of settlement among pioneer migrants in super-diverse London," J. Ethn. Migr. Stud., 2018, doi: 10.1080/1369183X.2017.1341719.

[9] D. J. Coates, M. Byrne, and C. Moritz, "Genetic diversity and conservation units: Dealing with the species-population continuum in the age of genomics," Frontiers in Ecology and Evolution. 2018. doi: 10.3389/fevo.2018.00165.

[10] R. R. Domingues, A. W. S. Hilsdorf, and O. B. F. Gadig, "The importance of considering genetic diversity in shark and ray conservation policies," Conservation Genetics. 2018. doi: 10.1007/s10592-017-1038-3.