



IUCN SSC Asian Elephant Specialist Group
Guidelines for the rehabilitation of captive elephants
as an option for augmenting wild populations



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2024



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Citation: Thitaram, Chatchote., de Silva, Shermin., Soorae, Pritpal., Daim, Shariff. and López Pérez, Ana Belén. 2024. AsESG Guidelines for the Rehabilitation of Captive Elephants as a possible restocking option for Wild Populations. *IUCN SSC Asian Elephant Specialist Group*

Terminology used in the document

Wildlife Rehabilitation: The treatment and temporary care of injured, diseased, and displaced indigenous animals, and the subsequent release of healthy animals to appropriate habitats in the wild.

Re-introduction: An attempt to establish a viable population of Asian elephants in an area of historical range where the species population has been extirpated.

Supplementation: Addition of individuals to an existing population of Asian elephants to increase genetic diversity, improve skewed sex-ratios, etc.

Soft release: A process in which animals are maintained in an enclosed area/pen at the release site for a period of time before release, for acclimatization. After the animals are released, they are given variable assistance such as continued food provision at or near the release pen.

Hard release: A process in which animals are transferred to a new location with no further human action taken to provide food or supplementary resources. This is more suitable for adult or sub-adult (self-sufficient) animals or social groups which have been translocated from a free-living situation and are being released into similar habitat at a different location.

Scope of the Guidelines

It is the view of the IUCN/SSC Asian Elephant Specialist Group (AsESG) that the primary objective of any and all rehabilitation and reintroduction of Asian elephants should be to promote viable, free-living populations in the wild, i.e. to contribute towards the conservation of the species. Therefore, the focus of this document is on rehabilitating of captive Asian elephants with the aim of returning them to historical range from which elephants have been greatly reduced or, in some cases, extirpated. We distinguish this overarching goal from the specific reasons conservationists, wildlife managers, or other stakeholders may have for embarking on the process, and the choice of individual animals selected to undertake it, discussed further below.

The lack of adequate guidance has previously resulted in poorly planned release attempts resulting in adverse consequences to both elephants and humans. Therefore, this guideline aims to describe the work of care of captive elephants, their rehabilitation in natural or managed habitat till they are able to adjust themselves to live in the wild, until their release into a suitable free-roaming area. This document is the first attempt to provide information and experience for the rehabilitating of captive elephants in the wild in preparation for reintroduction to the wild.

This guideline first discusses the planning stage, which includes the source of animals, areas to be released, human resource, budget etc. It then discusses the rehabilitation and post-release period, with particular attention to monitoring and assessment for the success of the project. However, elephants can live up to 60-70 years old, thus outcomes may be difficult to foresee.

These guidelines provide informed advice to decision-makers in Asian elephant range state governments, managers on the ground, non-governmental organizations, donors and other practitioners wishing to rehabilitate and reintroduce Asian elephant populations for the primary purpose of conserving wild populations in the long-term. Readers are also strongly advised to consult the IUCN Technical Guidelines on the Management of *Ex Situ* Populations for Conservation (2002) (<https://portals.iucn.org/library/efiles/documents/Rep-2002-017.pdf>), IUCN/SSC AfESG Guidelines for the *in situ* Translocation of the African Elephant for Conservation Purposes (2003) (<https://www.iucn.org/content/guidelines-situ-translocation-african-elephant-conservation-purposes>) and IUCN/SSC Guidelines for Reintroductions and Other Conservation Translocations (2013) (<https://portals.iucn.org/library/efiles/documents/2013-009.pdf>).

Why reintroduce or introduce Asian elephants?

Asian elephant populations have been in overall decline for several centuries across the range relative to their pre-colonial numbers, despite the lack of empirical data on prior abundance. Loss of habitat, together with capture and killing drive these trends. Against this backdrop, populations in particular locations may be faring better or worse, however, when populations fall below triple digits there may be cause for more acute concern due to the genetic and demographic risks of small populations. Although conservationists may feel that more elephants in the wild is generally better than fewer elephants in the wild, when evaluating whether elephants should be reintroduced to a particular area, it is advisable to carefully consider for what purpose this might serve from the viewpoint of the elephants, the people, and the landscape.

From the elephants' perspective, life in the wild is risky. However, if an animal is capable of surviving independently of people, especially if living with people imposes restrictions on natural behavior and reproduction, then the risk may be worthwhile. However, if living in the wild does not adequately meet an individuals' social and survival requirements, the temptation to remain close to human provisioning may be high.

From the perspective of wildlife managers or conservationists, which is perhaps the point of view that is most prominently considered, re-introduction to the wild may serve several functions. It may:

- 1) Augment genetic diversity
- 2) Augment a depleted population
- 3) Restore individuals that have no economic or ethical place in captivity.

From the standpoint of people occupying areas through which the released animals are likely to move, the aspirations above may not adequately compensate for the perceived risks elephants pose unless there is also some economic benefit. Typically, this will be unlikely. If there is animosity or opportunity to benefit by killing the animals, there will be a higher probability that a habituated animal may be injured or killed. Therefore, human attitudes must be carefully gauged. Alternatively, where elephants do not cause economic or physical hardship, they may become a source of pride. A review of multiple points of view, seeking perspectives from stakeholders likely to experience economic and social impacts due to elephants is encouraged (van der Water et al., 2022). A carefully thought-out communications and marketing strategy may be advisable to ensure that people are properly informed and supportive of what is taking place.

A major milestone for the released animals is reproduction in the new context, although this will be easier to detect for females than for males. The ultimate goal is to sustain healthy elephant populations alongside people, with no major loss of crops, properties, human or elephant lives.

Which elephants should be released?

The types of elephants that one might consider re-introducing fall into at least two categories. One set of candidates are those that have spent a substantial fraction of their adult lives among people. The other set of candidates are juveniles that may have been injured or orphaned and re-habilitated with the explicit aim of eventual re-introduction. These two types of populations merit different considerations.

Why try to re-wild elephants that have spent a substantial fraction of their adult lives alongside people? It is not at all clear whether animals that have had no natural foraging experience at all, such as those that have been reared at zoos, would be able to survive in the wild without significant hardship and possible conflict. Therefore, such individuals will not be under consideration here. More realistic candidates are animals that are semi-wild, that have experience in foraging, such as those that may have been employed at timber camps. The possibility of release arises when the economic activities that have supported such animals cease to be. One of the strongest arguments in favor of doing so is that the alternative is lifelong captivity. The availability of large numbers of elephants in captivity can spur the development of exploitative activities that profit by their presence, creating perverse economic incentives to continue capturing animals for captive use rather than allowing the practice to fade out. This can in turn have negative effects on wild populations. The risk, of course, is that human habituation might make such animals easier targets for poaching, or prone to conflict.

The argument for releasing rehabilitated calves is equal if not stronger. If an elephant has any prospect of living independently, it would seem to be the most ethical option to pursue. The successes of existing programs in India, Sri Lanka and Thailand have been modest, and would benefit from more transparent and systematic follow up studies of which individuals are likely to succeed and under which circumstances. As with adults, over-habituation presents a special risk especially since calves require social contact. Nevertheless, the fact that at least some individuals have both gained independence and reproduced offers hope that juveniles stand some chance not merely to survive, but even thrive. This alone seems to warrant investments to maximize their chances of success.

Who should apply these guidelines and how is this best achieved?

This guideline should be used with the specific purpose of rehabilitating captive elephants for release back to the wild by qualified and experienced experts. Due to the complicated factors to be considered, this is generally best achieved by assembling a multidisciplinary team to evaluate the various issues. The following skill areas and experts should be available: Asian elephant management, biology, behavior, translocation, community ecology, legal and policy issues, veterinary considerations and security, mahouts etc. When elephants are in the rehabilitation areas, or fully released to the wild, with overlapping or neighboring human inhabitants, a specialist should play a role to negotiate and deal with the communities in applying this guideline.

Brief history of Asian elephant re-introduction

Elephants have been reintroduced back into the wild in many parts of the world. The longest running effort has been in Africa under the David Sheldrick Wildlife Trust (DSWT), which aimed to rehabilitate and release wild African orphaned elephant calves to the national park in Kenya (McKnight 1995; Sheldrick 2005). More recently, efforts are under way at the Reteti Sanctuary in Kenya (Goldenberg et al. 2022).

Within Asia, releasing captive elephants back to the wild has been occurred for centuries during the war across continents when wild elephants were captured and trained as beasts of burden, and used in combat, like warhorses. There is evidence from the kingdom of Ayutthaya (A.D. 1351-1767), that elephants were captured throughout the country and sometimes released again (Lair 1997). There are anecdotal accounts of people calling and riding some of these ex-working elephants, that still remembered the orders of mahouts.

India

Many calves are orphaned as a result of human-elephant conflict or land-use changes, especially in Assam and Kerala. In the North Eastern state of Assam, the Centre for Wildlife Rehabilitation and Conservation (CWRC) has attended to a total of 309 elephant emergencies during the period of August 2000 to March 2020 (Wildlife Trust of India (WTI), 2020, unpublished; Choudhary *et al.* 2016). An alarming number of 182 Asian elephant calves, which were either temporarily or permanently displaced from the natal family/group has been attended by CWRC between the years 2000 and 2020 (WTI *pers comm.*). A total of 26 displaced calves were reunited successfully with family/group at the site of rescue itself where the type of displacement is purely

temporary (Mainkar *et al.* 2005; Menon *et al.* 2005; Choudhary *et al.* 2016, WTI 2020 unpublished).



Fig 1: Elephants being acclimatized in forest before release in Manas National Park, Assam



Fig 2: Group of released elephants at Udawalawe National Park, Sri Lanka under "Elephant Transit Home" project

Calves which could not be reunited were transported back to CWRC for long term nursing and rehabilitation following a working protocol developed by CWRC (WTI unpublished). Till August 2020 a total of 25 rescued calves were nursed and translocated to Manas Tiger Reserve in Assam for

rehabilitation in the wild, of which 15 individuals were successfully released and monitored post-release ranging from a minimum of 180 days to 900 days post-release. Evidence of reintegration with a wild group/family of at least 4 individuals have been recorded in the release habitat. Highly habituated calves who failed to get rehabilitated were transferred to a captive facility in Manas National Park, and seven calves have died during rehabilitation or post-release.

Sri Lanka

Since 1995, orphaned calves from the wild have been rehabilitated by the Department of Wildlife Conservation at the “Elephant Transit Home” and released back into the wild (Miththapala 2009). Many of these cases were also the result of human-elephant conflict, while a few the victims of war. There have been 117 elephant calves returned to the wild (mainly Udawalawe National Park) during 22 years of the project, with 17 calves born from released elephants (Perera *et al.* 2018) (Fig.2)). The aim of this project is to rescue and rehabilitate the orphaned elephant calves, and consequently release them to the wild.

Thailand

Another elephant reintroduction project has been conducted in Thailand with official initiation in January 1997 when the HRH Queen Sirikit of Thailand released three female elephants into the Doi Phamuang Wildlife Sanctuary. To date, 108 captive elephants have been released into the Sublanka Wildlife Sanctuary, Doi Phamuang Wildlife Sanctuary and Phuphan National Park (Fig.3). Wild elephants used to inhabit in these protected areas, but not anymore. Only one wild



Fig 3: Group of released elephants at Doi Phamuang Wildlife Sanctuary, Thailand

female elephant existed in Phuphan National Park. Nineteen calves have been produced through natural mating by released bulls (Thitaram *et al.* 2018). The aim of the project is to restore and conserve the natural habitat through the released elephants, as well as to create a self-sustaining wild elephant population in the protected area.

Planning Stage – Primary Considerations

Rationale

The rehabilitation of captive Asian elephants in the wild can serve as a conservation tool for augmenting wild elephant populations in range countries in order to ensure the long-term survival of the species. This is an example where the *ex situ* population can play a role or contribute to the conservation of the *in situ* population. The process will take a long period of time and involves an enormous amount of financial commitment. It will also involve many government agencies and stake holders in order to carry out the project successfully. Government policies and related wildlife acts can sometimes become politically sensitive issues, therefore the parties must be committed to carry out long-term management and conservation programs to safeguard the animals in their new surroundings as well as address the concerns of local communities.

Defining the overall objectives of the proposed rehabilitation of captive elephants in the wild

Before rehabilitation and reintroduction of Asian elephants, it is crucial to identify the advantages and disadvantages, prospective gains or losses from the project. The overall objectives should be discussed, identified and planned by all stakeholders. It requires a long-term commitment with high investments to adequately prepare for the potential impacts on local communities and other interests. In order to ensure an effective, efficient and successful project, the government, stake holders, veterinarians, biologists, mahouts and the local communities should work together diligently as a team.

The goals and objectives of rehabilitation and reintroduction of Asian elephants vary across countries. In India, the CWRC wanted to reunite abandoned elephant calves under human care back with wild groups. The Elephant Transit Home in Sri Lanka wanted to rescue, rehabilitate the orphaned elephant calves, and release them back to the wild. In Thailand, the elephant reintroduction project wanted to release elephants to restore and conserve the natural habitat, as well as create the self-sustaining populations of elephants in suitable protected areas.

Planning for rehabilitation and reintroduction can usefully follow the Species Survival Commission's approach to conservation planning for species, which requires specification of a goal, objectives and actions. Because of the complexity of elephant rehabilitation and reintroduction, it is crucial to have the experts with experience in elephant rehabilitation and translocation in drafting the protocol to identify critical considerations and avoid costly mistakes.

General feasibility and assessment

Many issues need to be considered before proceeding with rehabilitation and translocation. These include:

- 1) The overall objectives and justification of the proposed rehabilitation and translocation. This step is especially important where a feasibility assessment is needed to determine whether or not a project should proceed as planned, whether to wait until further information is obtained, or necessary security or infrastructure is in place etc., or whether or not the plan should be terminated.
- 2) Assessing the impact of moving elephants from the source site, where the owner and the mahouts might have strong bonds with them, to the rehabilitation center for purposes of re-enforcement/supplementation and reintroduction.
- 3) Deciding the number of elephants, sex and the age groups of the elephants that are going to participate in the project.
- 4) The government agencies, stakeholders and local communities to be involved in the project may wish to sign a memorandum of understanding for the project. Likewise, any socio-political, legal and permit issues should be sorted out with clarity in advance.
- 5) Selecting an appropriate rehabilitation and rewilding method of animal enrichment to ensure that the elephants are healthy and regain all their natural behavior. This will ensure the reintroduced elephants will be able to survive in their new wild natural habitat. This process must be done by engaging a professional elephant biologist who has studied elephant behavior.
- 6) Determining ecologically suitable release sites and specific areas for release based on screening and assessing habitat quality, security and management capacity in potential recipient areas, assessing the existing elephant population in the re-introduction area (numbers, age and sex ratio).
- 7) Beyond purely ecological considerations, reintroduction programs must also be sensitive to the vulnerabilities of local communities and every context may be

different. Elephants can not only damage crops and property, but also can present a danger to human life in surrounding local communities. Such occurrences can cause animosity towards long-term conservation effort. On the other hand, they may create increased opportunities for revenue generation or be a source of local pride. Risk/benefit analysis at each prospective location should be undertaken to assess potential safety concerns, socioeconomic costs and benefits of the reintroduction at any potential site.

- 8) Mechanisms should be put in place to address the specific identified risks *in advance* of re-introduction. Following implementation, mitigation and management of conflicts that arise between the local communities, other stakeholders, and elephants must be viewed as an ongoing requirement, beyond initial the re-introduction. Utmost care should be taken to adequately ensure the safety of surrounding communities.
- 9) Selecting an appropriate relocation approach and timing (e.g. soft-release approach or hard-release approach from the rehabilitation center to the recipient area). This will determine the infrastructure of the rehabilitation and the release area (e.g. if browsing paddocks or electric fencing will be required in the release area and the ideal season when the elephants should be reintroduced).
- 10) Setting up logistical coordination and planning mechanisms so that all the government agencies, stakeholders and the local communities can work together as a team.
- 11) The economic values and benefit that the reintroduction program can provide besides conservation (e.g. ecological restoration of the protected area, increased conservation value of the park, social pride and ecotourism that can increase tourism revenue to the park).

Budgeting

General issues to consider

Generally, reintroduction programs will be costly. Important questions will arise as to “where to find the money”, which is very difficult in most projects. Therefore, a project like this should be collaborative, with several organizations working together to help find the budget. For example a government could cover the main budget while a non-governmental organization might support it, or vice versa. Furthermore, if an elephant is the symbol in some area or countries, a fund might be created through other contributions. For instance, in Thailand, where the elephant is the symbol of country and play roles in Buddhist and royal family; thus, substantial amount of the budget was

donated through the merit and support of the royal family. Re-introductions are to be viewed as long-term projects that require the commitment of long-term financial and political support not only for implementation, but also measurement of outcomes.

Specific issues to consider when budgeting for Asian elephant reintroduction

There are several issues related to the budget of elephant reintroduction. The pre- and post-release management and research budget may require up to 10 years of investment as follows:

- 1) Land for the rehabilitation center or the recipient area: the area could be from donation or purchasing, even the cooperation with the government in the national park, wildlife sanctuary, or protected area.
- 2) Construction of facilities, holding areas, fencing.
- 3) Elephant cost: Animals may be acquired through donation or purchase, so long as stringent controls are in place to ensure that they are not part of an illegal trade. The cost of one elephant is very expensive, particularly at the young and reproductive ages. In Thailand one elephant at the age of 10-15 years may cost up to 2.5 million bahts (76,000 US dollars) (in 2018). Buying elephants (for any purpose) creates an increased demand on the captive market which further increases prices and thus the interest to supply, therefore we do not encourage the practice of buying elephants. If the animals represent the sole means of livelihood for their mahouts, it would be more advisable to provide alternative livelihood support than mere compensation for the animal itself. In most range countries, different government agencies themselves own captive elephants and if the government decides to agree and involve or even lead such programs, they can allocate animals.
- 4) Staff: This can include mahouts, veterinarians, biologists, rangers, educators, ecologists, external consultants, administrative staff etc. The exact composition and number of personnel needed depends on the number of animals to be rehabilitated and reintroduced. A minimum of two qualified mahouts must be present during any contact with elephants. A qualified mahout is a person the institution acknowledges as a trained, responsible individual, capable of and specifically experienced in the training and care of elephants. An experienced veterinarian and clinical staff are needed to run the rehabilitation elephant clinic. If the project grows and expands to several natural habitats as well as the number of elephants increases, more staff and budget are required.
- 5) Equipment: Tools for rangers and mahout, GPS, satellite collar to trace the animals, notebook etc. which requires budget to buy and maintain for long-term use. Thought

should be given to long-term data archiving, transparency and access, given that multiple stakeholders will be involved.

- 6) Vehicle: Four-wheel drive cars and motorcycles are necessary to use in the project.
- 7) Station in the forest or rehabilitation center: In order to monitor elephants in the forest or rehabilitation center, a base station or camp may need to be set up some place in the forest, as well as at the edge of the forest to prevent elephants from roaming out into the village or crop area, particularly during the cultivation season.
- 8) Reimbursement for loss of crops or lives. If there is not already a compensation program in place, one may need to be created. But it may be necessary to consider investments to prevent further loss of life if there are especially problematic issues identified at a later stage that were not anticipated during the preliminary risk assessment.

Identification of recipient area(s) for Asian elephants

Suitability assessments of potential recipient reserves

One of the keys to successful elephant rehabilitation, even if destined for the wild, is the potential recipient area. Elephant food and water are the major concern for this mega-herbivore, as they forage 200-300 kilograms a day. The recipient areas should have plenty and variety of elephant food and water across the year, particularly the dry season. Ideally, natural areas that once contained wild elephants would be preferable as the required food sources can be expected to be available. However, availability of elephant food and water around the year should be surveyed in the area to improve the chances of long-term survival. It is also important to know why elephants are no longer present. If elephants were eliminated due to human-elephant-conflict (HEC) or poaching then there is a high chance of déjà vu, and project failure. In areas where elephants have not been present for a long time, wildlife poaching should be overseen and investigated, and the local opinions concerning the possibility of having elephants present should be assessed. If people are inexperienced with wild elephants, communities may require training on appropriate behavior so that they do not panic or chase animals.

In cases where there are resident elephants in the release areas, this can be both positive and negative. Elephants are intelligent, with individual character, and can also be expected to develop through observation and social learning. The presence of wild groups can help juveniles learn about their habitat and acquire crucial foraging skills, if habitat is not saturated to the point that residents exhibit aggression toward the newcomers. However, problems such as crop raiding, fence-breaking, and conflict with people or other elephants might also be more likely to occur if they are released into an area where such behavior already exists among the resident elephant population and can

be picked up by observation. Similarly, people who are already experienced with elephants may already have very strong attitudes towards elephants, that can present a risk to the program and therefore must be studied, understood, and accommodated at the outset.

Size of Potential Recipient Reserve

It is difficult to define an ideal size for a potential recipient area, as it depends on the behavior of particular groups or individuals, as well as the climate and availability of food and water during the year. However, the size should not be less than 60 square kilometers per small group of elephants (e.g. 6-8 individuals) as the minimal home reported for a wild group was 57 km² in Sri Lanka (Fernando & Lande 2000); but home ranges greater than 600 km² have been observed in India (Baskaran *et al.* 1995). The released female captive elephants in the reintroduction project of Thailand showed the average home range of 40-46 square kilometers (Angkawanish & Thitaram 2012). If there are bulls, a wider area should be considered, as the bulls roam further, particularly during musth.

Identifying source animals

Wild vs. captive or semi-captive breeding

The elephants could be obtained either by allocation from the government, donations or purchasing from the previous owners. They should be healthy and without any infectious diseases; e.g. Elephant Endotheliotropic Herpesvirus (EEHV), Encephalo-Myocarditis-Virus (EMC) etc. (discussed below). To make sure that these animals are not illegally-caught, they should be officially registered by the authorized governmental organization. The ideal elephants are from the logging or those raised in natural habitat, who have spent time in the forest; they are more likely to be comfortable in a forest than the tourist or zoo elephants. These individuals should know how to forage, find other resources, and find their way around natural habitat. Furthermore, these elephants should be raised with other elephants, not isolated, as they are social animals; they should therefore know and recognize themselves as elephants, having spent time with others. If the mother or some other familiar adult is present, the calf should not be separated from the adult for rehabilitation and release; ideally both should be released.

Some individuals may be calves abandoned by wild groups or confiscated animals that were illegally captured and trained for other purposes. These animals may be good candidates for release, depending on their age and physical condition, as they may still retain familiarity with the wild environment. Animals that have undergone severe abuse, however, may need to be evaluated in terms of both physical and psychological health to determine whether they could survive and not present a hazard to people.

Logistical coordination and planning

Coordination Activities

Coordination will be required among three types of key personnel, which may be carried out by a coordinating body or through appointed positions within an organization. These key roles include those who deal with the elephants, those who deal with the release site, those who deal with legal aspects and those who deal with the communities. Specifically, there must be accountability for the following:

- 1) Elephant team: find and recruit elephants to be rehabilitated and released. These individuals should know and understand Asian elephant very well, for the context, behavior, culture, health and welfare. (Fig. 4)
- 2) Site preparation team: find the suitable place for rehabilitation and reintroduction. Individuals should be familiar with the ecology of both elephants and the environment, as well as with the surrounding human landscape.
- 3) Legal team: work on laws and regulations in obtaining animals, as well as the process of releasing elephants, such as the identification card, transportation, permit etc.
- 4) Community engagement team: study and understand human dimensions of the prospective release area, develop plans to address needs and concerns that arise.



Fig 4: Elephant team: consists of people who know and understand Asian elephant very well (e.g. mahouts). They can help to trace and record the elephant behavior in the forest.

Planning for procurement and logistics

The procedure of elephant translocation, quarantine, rehabilitation and reintroduction should be well-planned. Suitable elephants should be prepared with identification, health certificate, ownership and other documentation and permission for elephant to be translocated. Sufficient food provisions should be on hand for the entire journey. Water should be available on the truck or any resting spot during the trip. If the elephant gets sick or injured, the transportation should be rescheduled. If the elephant calves are less than 10 years old, elephant endotheliotropic herpes virus should be diagnosed molecularly or through serology to prevent the disease occurred after transportation. Vitamin C should be given before transportation in order to reduce the risk of disease occurrence. (For health monitoring, please see elephant health care guideline)

Staff of the destination and route of transportation, as well as police or any officer should be notified. Duration should be calculated for the whole trip. If the trip is too long, both elephants and people should have the place to rest to avoid too much stress and exhaustion. Date and time should be well prepared and informed to all stakeholders.

Personnel, capacity and experience

Staff requirements

The following are basic requirements:

- 1) Ecologists to check the ecology and habitat in the rehabilitation and release site
- 2) Behaviorists (ethologists) to study the behavior of elephant pre- and post-release
- 3) Veterinarians to assess the health of elephants pre- and post-release, as well as treat elephants when health problems occur
- 4) Educationists/ Sociologist to work with villagers and community
- 5) Researchers to conduct research and study the reintroduction of elephants
- 6) Fundraisers to find the budget, support and sustain the whole project
- 7) Mahouts to control and monitor elephants
- 8) Rangers to work with mahouts and a behaviorist to observe elephants in the natural habitat
- 9) Coordinators from government and non-governmental organizations, which varies among countries, areas and regulations
- 10) Government law enforcement personnel

11) Drivers experienced in transporting elephants

Building local capacity for Asian elephant rehabilitation

In the long-term of the project, local capacity is extremely important to provide the local community engagement with the released elephants, and protect them from poachers, understand and get benefit with having elephants around. The project may hire the local people as staff, mahout, rangers etc. for the long-term. This will provide incomes, as well as spread the knowledge and get more people involved in the project.

Demographic considerations

Asian elephants are among the slowest reproducers in the animal kingdom, therefore they likely have relatively low resilience to offtake beyond natural mortality. Based purely on physiology, a female can produce a calf at best once in only three years. However, given the nutritional resources required to adequately nurse a calf, unless she is in exceptionally good condition four years is more optimal. The birth intervals of most natural populations is unknown, but it has been observed that birth intervals under four years occur typically when a female loses her calf within less than a year (de Silva *et al.* 2013). Because birth intervals may lengthen as a female gets older, the population average may in fact be substantially longer, at six years or more.

The other major limitation on elephant populations is the age at first reproduction for females. Though physically capable of producing calves at the age of 10, they are more likely to have their first calves between the ages of 11 and 17 (de Silva *et al.* 2013), though it may be earlier for individuals that have been captive-reared, well-fed, and in excellent physical condition. The final consideration is the mortality rate of all age and sex classes, especially adult females. The highest risk of mortality is in the 0-2 year age class, and additionally for males, the period of dispersal.

If females within a population reproduce as early as possible (primiparity at 11 years) and as quickly as is healthy (birth intervals of 4 years) and adult mortality is relatively low (3% or less) they may be able to tolerate as much as 30% mortality in calves under the age of three. But if the population exhibits more realistic attributes with primiparity occurring around 13 years and birth intervals closer to six years, loss of these young calves must remain below 5% (de Silva *et al.* 2019). If a calf is separated from its mother within the first year of life and she is otherwise healthy, it is very likely that she would come into oestrus again quickly. Therefore, in populations where reproduction is slow or female mortality is higher, the rescue, rehabilitation and eventual release of calves that may otherwise die could play a significant role in improving population persistence.

Genetic considerations

Three subspecies of Asian elephants are generally accepted although there are four designations; i.e. the mainland (*Elephas maximus indicus* and *E. m. maximus*), Sumatran (*E. m. sumatranus*) and Bornean elephants (*E. m. borneensis*). No major genetic difference was found in Sri Lankan elephants apart from those in mainland (Fernando & Lande, 2000; Fleischer *et al.*, 2001; Vandebona *et al.* 2002); thus, there was no strong evidence to determine as distinct subspecies. However, elephants from Borneo, were found to be a new subspecies with a specific mitochondrial D-loop sequence not seen elsewhere in Asia, which was confirmed by Sharma *et al.* (2018) as the colonization of Borneo. Furthermore, a relatively low genetic diversity was observed in the Bornean population by nuclear microsatellite analysis (Fernando *et al.*, 2003).

Therefore, genetic analysis should be considered before releasing by the mitochondrial or chromosomal DNA markers. As the goal of reintroduction to develop the viable population that can maintain the genetic diversity for 100 years (Frankham *et al.*, 2002). Restocking of the elephant to the area, where wild counterparts exist, should be with the same mitochondrial DNA clade. In order to set up the new viable population by releasing elephants into the area where elephants used to stay, elephants should have a variety of both mitochondrial and chromosomal DNA to set up high genetic diversity, which will bring long-term viability and no inbreed complications. However, in general, release programs are expected to operate locally, such that subspecies are not mixed.

Behavioral considerations

Asian elephants exhibit very dynamic fission-fusion social organization. It now appears that these tendencies may originate very early on where calves of both sexes as young as three years old begin to move around with familiar non-mother companions. On the other hand, some individuals, even males, may remain close to their mothers until the age of nine or ten and some females may do so well into adulthood. This fluidity seems to make it difficult for Asian elephants to form clear dominance hierarchies and may make it easier for Asian elephant populations to absorb newcomers than for a species that has a more fixed and rigid family structure. However, this does not mean that newcomers will be tolerated by existing social groups without aggression. These are critical issues to consider when considering both the source animals and where they should be released.

Juveniles

In an environment that is already well-occupied by elephants, young animals between the ages of 4-6 are more likely to be able to integrate themselves into existing wild groups, especially

if they are female. This socialization will help them explore the territory and learn about its resources, which will be essential to survival. Releasing multiple female calves as a group also seems to have a positive influence because the relationships formed through familiarity at the rehabilitation facility lasts into their adult lives and helps them found their own independent social groups as they mature. While it is difficult to speculate on a good group size, 3-5 individuals may be a manageable number both from a logistical standpoint and from the perspective of wild social groups.

Males, even if juveniles, are less tolerated by adult females if they are unfamiliar, and therefore may either wander solitarily or seek the company of other males. Although male elephants may not have stable groups analogous to females, it is now becoming increasingly evident that socialization is as important for males as it is for females. In addition to using older individuals as guides and role models, affiliative relationships can help younger males to gain access to resources that they would not otherwise be able to use. Social support against other males may also later be advantageous for both foraging and reproduction. It is therefore advisable that male calves also be released in groups that contain other similarly-aged males. However, in areas where crop raiding is prevalent, socialization with mature crop raiders may predispose younger animals to do so as well. For males especially, it is important to choose release sites that are as distant from croplands as spatially possible.

Because elephants are so sensitive to social cues, it is of critical importance that they do not become overly habituated to human contact. For the same reason, hard-release appears to increase the chances of animals becoming independent than soft-release. While very young or sick calves may need constant human oversight, those that are healthy should have minimal contact and not become too strongly bonded to human caretakers especially if the release site is likely to have a high degree of human presence. Even if the release site is relatively isolated, over-habituation may increase the likelihood that they fall victim to poaching. This guidance notably contrasts with the practices devoted to African elephants, such as Sheldrick's orphanage.

As generalist feeders, elephants must learn which plant species to eat, and when to eat them. Although this has not been studied yet, the propensity to investigate crops might be reduced if animals are sufficiently familiarized with abundantly available native species. It may be especially valuable to introduce diversified seasonally available foods (e.g. flowering plants) to the diet while in human care, in addition to staple fodder that is more easily obtained in bulk such as grasses. In environments that are highly seasonal it would be essential to be exposed to sub-optimal or even unpleasant fall-back foods such bark, thorn scrub, roots and vines, because these may be the only forage available at certain times of year. Species that are actively cultivated, such as palm tree fronds, should be avoided so as not to make them targets upon release. A diversified diet could be the single most important thing about which a young animal needs to learn prior to release. Although it is possible that they would diversify their diets on their own gradually, pre-existing

knowledge will undoubtedly be helpful for survival. Additional skills that may be useful include digging wells and consuming clay.

In order to breed successfully, females would benefit from some experience with handling young calves, and especially with nursing. Sub-adult females in the wild act as surrogates for adults and let young calves nurse. Even without adults to model the behavior, some juveniles may be prone to be attentive to younger calves at rehabilitation facilities. Such maternal or alloparental behavior is a good indicator of future success at caring for offspring. Individuals who do not develop skill in calf care may eventually breed but have lower success.

Adults

Source animals that are already adults that have foraging experience avoid issues raised above if their release site is similar to the environments they are used to. If not, the risk arises that they may also seek out easier food sources, such as presented by crops or plantations, if nearby. Adults are also more likely to encounter hostility from resident elephants. As with juveniles, releasing animals as intact social groups should help in dealing with the inherent stress of being in an unfamiliar situation. But unlike juveniles, adult females may find it easier to assimilate into habitats that are relatively empty and have a very low density of elephants to begin with. This creates a slight paradox however, because in order for the local population to become viable, additional introductions must be made until it is observed that reproductive rates are healthy enough to maintain on their own. The reproductive lifespan of a female Asian elephant realistically will not be more than 60 years; therefore, the release of older animals will not give rise to sustainable populations until there are a sufficient number of young females to carry it forward. Unless females already have juvenile calves with them, this entails a period of ten years or more, until the second generation reaches sexual maturity.

By contrast with adult females, mature bulls may be the most flexible in terms of their ability to cope with any type of release site, since they will naturally disperse over larger distances than females. While it is still better to avoid areas with human activity if possible, it may be beneficial for bulls to be released into areas with female groups. This does not necessarily mean they will stay there, but should provide incentive for doing so.

The issue of habituation is as relevant for adults as for juveniles, for the same reasons. If possible, release sites should be as far from human activity as possible. However, remoteness can in itself increase the risk of poaching for individuals of any age/sex class, therefore the security status of the prospective release site will be of primary concern, and movement monitoring in the post-release period will be crucial.

Veterinary considerations

Introduction

Animals held in captivity and/or transported, even for a very short time, may be exposed to a variety of pathogens. Furthermore, animals held in captivity are frequently exposed to diseases not usually encountered in their natural habitat. Release of these animals to the wild may result in introduction of disease to conspecific or unrelated species. Even if there is a very small risk that the captive elephants have been infected by exotic pathogens, critical care should be taken to avoid this. The potential effects of diseases introduced to the wild are often so great that this precludes returning the elephants to the wild without careful screening. While some of these diseases can be tested for, tests do not exist for many animal diseases. Veterinarians and quarantine staffs, assuming that the species in question is only susceptible to certain diseases, might not test for the diseases picked up in captivity. It should be presumed that all diseases are potentially contagious.

The process of screening and testing for disease should take place around 30-90 days before releasing to the wild. The candidates for re-introduction should be separated from other elephants, both by stable, cage or long chains to prevent the transmission of unknown diseases or pathogens from both new arrivals to the inhabitants, or the other way around. The pathogenesis and period of infection of the some infectious and zoonotic diseases are still unknown, which should take time to be closely monitored. The monitoring staff or team should not be changed in each elephant because they can observe the change/adaptation/clinical signs of that elephant.

The veterinary guideline for wildlife before translocation and release to the wild was well described by Woodford (2001). The veterinary consideration before translocation was reported in the IUCN/SSC AfESG Guidelines for the *in situ* Translocation of the African Elephant for Conservation Purposes (Dublin & Niskanen, 2003).

Diseases of concern

There are many diseases which should be considered before releasing the elephants to the wild. The Asian Elephant Specialist Group Emerging Diseases Working Group, has identified the distribution of emerging diseases affecting wild and captive elephants and develop guidelines to treat, minimize, and manage its spread. Their analysis showed the most two important emerging diseases were tuberculosis and Elephant Endotheliotropic Herpesvirus-hemorrhagic Disease (EEHV-HD). These two disease are briefly described in this guideline and the details can be found on the website and book given below.

Bacterial diseases:

- 1) Tuberculosis: chronic disease in elephants and can be transmitted to human and *vice versa*. Monitoring and control of TB (*M. tuberculosis*, *M. bovis*) in both elephant and human are necessary. Triple trunk washes within a week for mycobacterial serology culture (8 weeks) should be performed with negative culture results and no clinical signs. All information of TB was available at the guideline for control of tuberculosis in elephants (https://www.aphis.usda.gov/animal_welfare/downloads/elephant/elephant_tb.pdf).
- 2) Haemorrhagic septicemia *Pasteurella multocida*
- 3) Anthrax (*Bacillus anthracis*)
- 4) Brucellosis *Brucella spp.*
- 5) Melioidosis *Burkholderia pseudomallei*
- 6) Leptospirosis *Leptospira interrogans*
- 7) Salmonellosis (*Salmonella javiana*, *S. butanam*, *S. welterveden*, *S. typhimurium* is reported to be the causative organisms in elephants)
- 8) Mycoplasmosis *Mycoplasma spp*
- 9) Colibacillosis *Escherichia coli*

Viral diseases:

- 1) Elephant Endotheliotropic Herpesvirus-hemorrhagic Disease (EEHV-HD) is a highly fatal infectious disease that threatens both wild and captive juvenile elephant populations worldwide. This viral disease affects juvenile Asian elephants age between 1-10 years old by causing acute fatal hemorrhage. Vague clinical signs as lethargy, anorexia, fever and more specifically edema of the head and neck and cyanosis of the tongue present in many cases, which ultimately results in a fatal outcome within 1-7 days after clinical signs was observed, and around 70-80% mortality rate present in EEHV HD cases. Information are available at <http://eehvinfo.org/>
- 2) Foot and mouth disease
- 3) EMC (Encephalo-Myocarditis-Virus)
- 4) Rabies
- 5) West Nile Virus
- 6) Blue Tongue Virus

Parasitic diseases:

- 1) Trypanosomiasis (*Trypanosoma evansi*) (from Tabanus flies bite)
- 2) Gastric myiasis *Cobboldia elephantis* (larvae from Bot flies laying their eggs near the mouth and base of tusks)

- 3) Gastrointestinal nematodes (e.g. *strongyloididae*, *strongylida*, *ascarida*, *Spirurida*)
- 4) Intestinal Trematoda (e.g. *Gastrodiscus secundus*, *Pseudodiscus spp.*, *Pfenderius spp.*)
- 5) Liver fluke (*Fasciola jacksoni*)
- 6) Liver nematode (*grammocephalus spp.*) in juvenile elephants
- 7) Cutaneous filariasis (*Indofilaria spp.*)

Information of bacterial, viral and parasitic diseases in Asian elephants are available at <https://www.elephantcare.org/> and Fowler and Mikota (2006).

Physiological concerns

Stress in wild animals is one of the physiological responses from various causes e.g. climate, social and interspecific interactions, as well as human-associated activities such as cattle grazing, hunting, tourism activities, and logging. Prolonged stress can suppress immune function, increase disease susceptibility, lead to abnormal behavior, and have deleterious effects on fitness. Therefore, monitoring stress through the fecal glucocorticoid metabolites (fGCM) of elephants pre-, during, and post- release is an optional method to assess the health and welfare of the reintroduction process. Methods for non-invasive fGCM monitoring have been described by Pokharel et al. (2017)

Veterinary examination of Asian elephants for health check prior to reintroduction

Minimal requirements for elephant quarantine program prior to reintroduction is recommended as following:

1. The new elephant should be maintained with physical separation from all other resident elephants. This should include provisions to prevent contact with feed, bedding, or feces/urine between animals.
2. Initial visual assessment of the elephant, along with review of the medical records, to determine health status should be used to develop an individual quarantine plan.
 - Ideally, the recommended length of quarantine is a minimum of 60 days. However, this may be changed in light of social concerns or detection of abnormal health status.
 - Risk of disease transmission between animals should be balanced with the concern for well-being (physical, psychological, and social) of the elephant.
3. Quarantine procedures should be planned and implemented as the standard protocol when the elephant arrives.

- Physical examination, body condition score assessment
- Blood collection for complete blood count, blood chemistry, serum and DNA bank
- Blood collection for specific diseases investigation as mentioned above
- Fecal collection for parasite examination should be performed.
- Deworming with anti-parasitic drugs: Albendazole, Mebendazole, Febendazole, Fenbendazole etc. Investigation from fecal parasite and egg should be performed.
- Ivermectin administration (depends on veterinarian's concern)
- Supportive drugs: vitamins or herbal drugs (depends on veterinarian's concern)

4. Dietary supplements should be concerned due to the elephant's condition

- Fodder (high energetic food) or concentrate: food pellet, corn, pineapple, banana, sugar cane etc. It should be noted that these kinds of high energetic food are not necessary if elephants are in good condition or obese. Instead, they should have more exercise.

- Fiber: grass
- Appetizer: tamarind, sticky rice with salt, herbal supplement
- Mineral block or salt lick
- Fodder: fiber ratio should be 1:10

5. Release from quarantine should be the decision of the veterinarian (after completion and review of results from any quarantine procedures), in conjunction with the assessment of the elephant management staff.

Post-mortem examination

Post-mortem examination protocol is well described by Cheeran & Nair (2003); Miller & Terrell (2016); Keet & Bengis (2000). However, the veterinarian or inspector should realize that post-mortem examinations are often performed in natural habitat where the equipment, human labor, transportation, and sample collection tools are limited. Occasionally, the inspector and team have to walk through the dense forest or up high mountains; thus, equipment, tools and sample collection devices should be appropriately listed and prepared. Particular diseases, cause of death or even the forensic science should be critically recognized, and the inspector should contact the specific laboratory or wildlife forensic science organization in advance to submit the samples, or use special investigations, particularly with poaching. Critical precautions for the inspector himself, especially with the zoonoses i.e. tuberculosis, should be taken when the examination is performed.

Euthanasia

Euthanasia is the process of a humane inducing death in an animal with minimal pain and distress, which results in rapid loss of consciousness followed by cardiac or respiratory arrest and the ultimate loss of brain function. Veterinarians should take responsibility to ensure that the animal is managed with the highest degree of respect, with an emphasis on making the entire procedure/operation as painless and distress free as possible. The euthanasia guideline for elephants is described in the American Association of Zoo Veterinarian (AAZV)'s Guidelines on Euthanasia of nondomestic animals (2006) and British & Irish Association of Zoos & Aquariums (BIAZA)'s Management Guidelines for the Welfare of Zoo Animals (2010).

Euthanasia in elephants can be carried out as a 2-stage process involving heavy sedation or anesthesia (Xylazine hydrochloride/ Etorphine hydrochloride) to let the elephant enter heavy sedation, recumbent, or unconsciousness followed by intravenous administration of 40-60 mg/kg of potassium chloride, to induce cardiac arrest. Veterinarians should confirm the death of the animal. Potassium chloride can be easily obtained, transported and mixed in the field. There is no toxic effect of both potassium chloride and sedative drugs to the scavengers.

Safety considerations

General

Elephants are large animals with strength, which can be harmful to people when they are careless; thus, elephants could attack or be aggressive to people during the program. Elephants can be injured during transportation. The truck driver should have experience when driving with heavy and unstable object with a mind of its own.

Release-site considerations

At the release site, attitudes from local villagers to elephants is crucial, that the staff should investigate to see positive or negative idea to have elephants around. There are many factors to be considered while selecting a suitable release site:

- 1) All sites chosen for release should be within the historic range of the natural distribution of the elephant.
- 2) The best site for reintroduction is within a gazetted protected area so that the elephants are well protected from poachers, human encroachment, serious HEC and land conversion. However, it must be recognized that they may not stay there.

- 3) The site should be accessible by road for easy management and monitoring of the released elephants.
- 4) The proposed site of release should be assessed for habitat suitability and food availability.
- 5) Study on socio-economics should be performed to understand the baseline conditions of potentially impacted communities.
- 6) It should be evaluated whether there are any existing programs that can address the needs of communities that are potentially impacted by elephants, or whether such measures have to be initiated. Training and resources must be provided to all those who may be affected. Even if the released area is well selected and assessed, the local people are one of the key factors involved. Local inhabitants may raise questions such as:
 - Will elephants attack human e.g. staff, rangers, villagers, tourists?
 - Will elephants damage their crops?
 - Will elephants harm domestic pets or cattle?
 - Will elephants destroy properties?
 - Can elephants find sufficient food in the forest?
 - What benefit they can gain from having elephants nearby?

These questions and attitudes of villagers are important, and answers to commonly anticipated questions can be prepared in advance based on appropriate contextual research conducted during the preparation phase. Effort must be made to minimize the spread of rumors, misinformation etc. that can be harmful to the people, elephants, and program. Likewise, effort may be required to determine whether there is any danger of poaching as revealed by peoples' attitudes.

Legal considerations pertaining to Asian elephant reintroductions

Rehabilitation and reintroduction of elephants must follow the regulations of each area and country. In India and Sri Lanka, the process of rescue, rehabilitation and releasing of wild orphaned elephants back to the wild was mainly performed and authorized by the Department of Wildlife, which is the same organization and uses the same regulations. In Thailand, where captive elephants mostly belong to private sections, and are under the Draught Animal Act (Beast of Burden Act), BE 2482 (1939), registered as draught animals by the Department of Provincial Administration, Ministry of the Interior; while the wild elephants are under the Wild Animal Reservation and Protection Act, B.E. 2535 (1992) by Department of National Parks, Wildlife and Plant Conservation, Ministry of Natural Resources and Environment. Thus, the reintroduction process in Thailand is rather

complicated, as releasing the captive elephants back to the wild, which aims to establish a viable population and for these captive elephants to change their status to become wild elephants. This is still under the process, and probably needs separate or new regulations, even if they are all the same species.

To perform a project like this, the stakeholders should study the laws and regulations of each area and country. It would be more complicated to set the project to transfer or rehabilitate from one country to another country, as the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES) permit is required to do so.

Rehabilitation period

Rationale

The period of rehabilitation (or soft release) varies among elephants may range from months to years, during which care takers will need to address both the physical and psychological needs of elephants, so that they acquire all the skills needed to survive in the wild. Elephants should be closely monitored to observe the behavioral progress of each individual as they may be positively or negatively influenced by human care. Mainkar *et al.* (2005) mentioned the imprinting behavior of the wild calves under human care. After releasing, they would approach humans, which would be dangerous for both released elephants and humans. Such human-seeking behavior should be reduced by maintaining minimal contact with caregivers.

At the end of the rehabilitation period, elephants should be capable of exhibiting the full suite of behaviors (foraging, playing, mud and dust bathing, aggression, social behavior etc.) that they require. Individuals' progress may be documented and studied to ensure they are capable of executing these crucial behaviors, and if not, they may require exposure to other individuals who will model the behavior. Social competence and foraging skill are the key requirements for all graduates to possess, which are addressed in greater detail in the following sections, in addition to physical health considerations.

Socialization

An important part of the rehabilitation of elephants before they can be released, is to ensure that the females and juvenile individuals (adult male elephants could be released on their own) have formed a cohesive group and that they express social behaviors similar to those in the wild. It is very common for captive elephants to have been raised in isolation from other elephants, leading to a lack of social skills, thus complicating the social groups that are created from unrelated elephants within these release programs (Fig.5). For this reason, the formation of a group in

captivity, can be a long and difficult process, especially if the elephants do not show an immediate affinity for one another. These conditions make it difficult to create general timelines for group formation, as each case will be based on the personalities, age, and backgrounds of the elephants involved. Forcing elephants to be together without monitoring their social behaviors could lead to high levels of stress, injuries, aggression and physiological disorders.

In order to avoid these non-desirable situations, the formation of a new group should follow clear steps and be closely monitored by someone experienced in elephant behavior. Behavioral data should be collected during each phase on aggression, submissive behavior, undesirable/stress-related behavior, and affiliative behavior. These data should be used to augment decision-making. Other variables that must be considered in any introduction include staff experience and confidence level, enclosure type, and the facility's elephant management protocol. It is also very important to be patient, not rush the process and not have expectations of how many elephants and/ or what individuals need to be part of a group. When to move forward in the introduction steps and which elephants can be placed together should be determined, in the most objective way possible, by the behavioral data observed in each step.

Below are the steps suggested in the formation of a cohesive group. Please note that these steps are slightly different for wild orphaned/ juveniles and for captive born elephants since their management requires different protocols.



Fig 5: Social time between a group of captive elephants during the rehabilitation period at the Elephant Conservation Center, Sayaboury, Lao PDR.

1) *Document behavioral profiles, backgrounds, and health checks of all elephants involved*

Each elephants' personality should be considered throughout the process. An interview with the mahout/caretaker for each elephant could provide useful information. This interview should clarify points like previous social experiences with females, males and/or calves, previous pregnancies and number of calves, individual personality traits (e.g., dominant, aggressive, social, submissive), previous working/living conditions, and existing social bonds (i.e., relatives or elephants that already formed strong bonds). This profile for each elephant is a useful tool in decision making along the grouping process. A health check should also be performed by an experienced elephant veterinarian to ensure that the elephants are free of diseases or severe injuries before any introduction with conspecifics.

2) *Familiarization period to the facility, mahout (if applicable) and unknown elephants*

If the elephants are going to be grouped in a new place or facility, an important step is to give them time to get familiar with the unknown facility before any interactions with unknown elephants take place.

If the elephants were born in captivity and the mahout changes before or during the grouping process, it is crucial that the elephant and the mahout be familiar with each other and the mahout can safely handle the elephant before moving forward in the grouping process. It is highly recommended that the old mahout and the new mahout work together as long as possible, to make this transition softer, gentler and safer.

If the elephants were wild orphaned calves/ juveniles, the staff involved in the process should have the skills and experience to safely intervene in case of unwanted situations.

Before any physical introductions, the staff involved in the process need to give time to the elephants to get familiar with the unknown elephants through visual, auditory, and olfactory means. This can be done by sharing common paths, bathing, feeding and resting areas at different times. It is important to observe how the elephants react when they see each other from a distance, when other elephants vocalize and when they smell urine or fecal from the others.

The length of this period will depend on how quickly the new elephant and the mahout bond with each other (captive born elephant) how the elephant responds to the new place and how they respond to the sensorial information from the other elephants.

3) *Limited physical contact*

At this stage, elephants will have the opportunity for limited physical interactions with each other under close supervision of the mahouts. If the elephants were born in captivity and already have a mahout, the elephants will be placed in a way that they can touch each other but can still be

separated or handled as fast as possible if needed. In free contact, mahouts should be near their elephants at all times and inappropriate behavior, such as aggression, should be anticipated, controlled or eliminated by the mahout. It is recommended to restrain individuals with very dominant, aggressive or unknown personalities during these introductions. They should be close enough to be able to touch but far enough to not injure other elephants. Elephants that do not pose a potential threat to others should not be restrained so they are free to move away and seek refuge. Keep in mind that the more elephants participate in these initial interactions, the more difficult and dangerous it will be to control unwanted situations by the people in charge, so fewer animals would be better.

If the elephants were wild orphaned calves/ juveniles, these first interactions can be done with a physical barrier, such as a fence, set up in a way that the unknown elephants are physically separated. The barrier will allow limited physical contact between the elephants but avoid physical aggression. This limited physical contact will allow the staff to record how the elephants react to each other in terms of affiliation, aggression, or submission. Inappropriate behavior should be closely monitored. This information is crucial to moving forward in the grouping process because it helps identify which individuals can potentially be placed together in a social group. Interaction between the elephants should never be forced by the handlers as this can have a negative effect on the socialization process.

4) Physical introduction

The individuals that demonstrate affinity with one another can be placed together in the same physical space without having the mahouts nearby. The area chosen, (enclosure or open space) for the physical introductions should be large enough to let elephants move away from each other as well as to provide different routes of escape, different shelter and feeding choices. If the area is too small, the likelihood of observing aggression or attempts to escape increases. Preferably, the area should be in their natural habitat with a large diversity of food, shelter and preferably with a water source. In the early introductions, it is better to choose flat areas and avoid terrain with a lot of unevenness. If natural food is not available, the food should be spread out in different areas to avoid food competition, which could lead to aggression. The introduction area should be located far away from disturbances and human activity and should not be located near local farms to avoid tempting the elephants to break the fences or leave the area for food. (Fig. 6)

All appropriate personnel should be present at the introduction. Qualified mahouts, especially those most experienced and familiar with the individual elephants, should be present at all times. A veterinarian with medical and immobilization equipment must be available and on standby. The team involved should allow the elephants to express natural behaviors freely while still being capable of interfering in aggressive or unwanted situations. Group composition, social

behavior, and proximity need to be recorded to assess social cohesion and interactions of the group. While the group is forming, aggression can be exhibited within the elephant group. Stopping an introduction too soon will not lessen aggression during subsequent introduction attempts. Elephants that are allowed to “settle their differences” will establish their positions with respect to one another and will usually not engage in aggression again (Burks et al., 2004). An important aspect of any introduction is to know at what point to intervene to prevent aggression from reaching the point of injury to one of the elephants. If aggression becomes frequent between two elephants that would be an indicator to separate these individuals permanently.

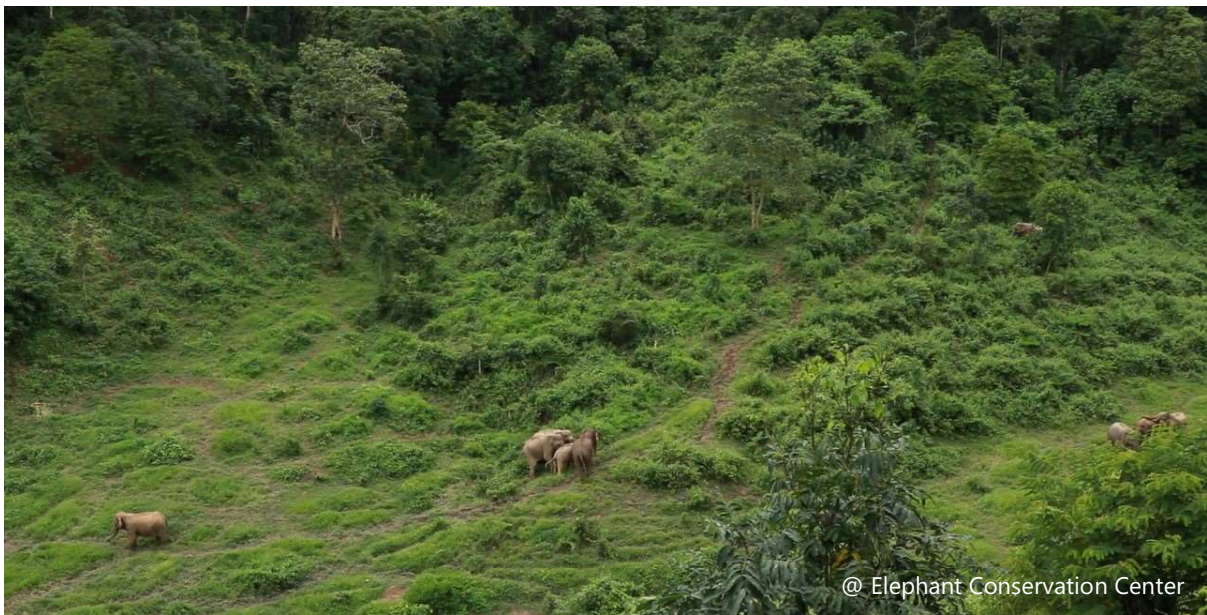


Fig 6: Example of area selected for physical introductions at the Elephant Conservation Center, Sayaboury, Lao PDR. Please note that the area is big enough to allow the elephants to create different social groups and to keep enough social distances with unwanted individuals

Some play behaviors like pushing, kicking, charging, etc., can be easily confused with active aggression. In most cases, the main difference between aggression and play/affiliative behavior is the intensity of the behavior and the response of the receiving elephant (Fig. 7). For this reason, it is important that the person in charge of observations is familiar with all these behaviors and can accurately assess the situation. If severe aggression occurs, notify the incident to the elephant manager and/or chief mahout and document it as a guide for others.

During the formation of the group it is important to prioritize putting together relatives or elephants that are showing strong social bonds. It is recommended to have a group with individuals of different ages, especially adult females, juveniles and calves when possible. Some elephants may never fully adjust and be comfortable with conspecifics. In this case, it may be in the best interest and welfare of the individual elephant to be housed alone. Once a group is settled, keep the

members of the group as consistent as possible. Introduction of new individuals or frequent switching of group members could have a negative effect on the cohesion of the group and could lead to behavioral and physiological disorders. Do not bring musth elephants to the social enclosures for safety reasons, and only bring one adult male at a time to interact with the female group.



Fig 7: Examples of play/ affiliative behaviors observed during the herd formation at the Elephant Conservation Center, Sayaboury, Lao PDR.

5) Monitoring the settled group in different areas

Once the group is settled, the group should be moved to different areas to verify whether the observed cohesion and behavior is not a result of the confinement of the regular enclosure. If the cohesion remains constant while moving to a more natural or larger area, such as an unknown piece of forest, it can be assumed the group has strong social bonds. Before attempting to release a group, even once they formed a cohesive group, other parameters such as success in finding food, water, shelter, protection of the group, and the tendency to approach local farms should be closely monitored, as these are also key points in a successful release. It must be recognized that the group may not remain together, depending on the changing needs of individuals, especially within mixed-sex groups.

Food and foraging

During the rehabilitation period for orphaned elephant calves before releasing, bottle feeding with milk should be given to them every 2-3 hours. The milk replacement formulary and amount are described by Emanuelson (2006). Calves should be with humans only during feeding time, which takes less than 5 minutes each meal to avoid an attachment to caretakers (Fig. 8). More information is available on the Elephant Transit Home project (<http://www.eth.dwc.gov.lk/>). Once

animals are weaned, they should be gradually provisioned with the natural food items that they are likely to encounter in the environment they will be placed in.



Fig 8: Milk feeding program at the Elephant Transit Home, Sri Lanka. Feeding time should be short to avoid an attachment to caretakers

The ability to forage for food is crucial for survival. In the wild, calves learn to forage by smelling and tasting food plants that is being consumed by the adults around them. How is this knowledge to be acquired in the absence of such experience? Some captive elephants, such as those raised in their natural habitat (e.g. timber elephants), have more experience than those in zoos, city or tourist camps. As these elephants are tethered in the forest, and moved to other places regularly in the forest, they have experience in foraging, even if not as much as fully free-ranging elephants. However, it may be sufficient for them to survive post-release.

If elephants do not have any experience in foraging in the natural habitat, release is inadvisable. However, if it is unavoidable, they should be released in a group with other foraging-experienced elephants, or be trained for foraging, particular before bringing them to the project, and during the rehabilitation period, when they could learn how to find food as well as water. In the rehabilitation period, food (preferable with grass, bamboo, or other roughage which the animals used to eat and are readily available in the releasing area) should be provided 4-5 times per day in the amount of 6-8% of the body weight, and gradually decreases to let the animals spontaneously forage, until they rely on the natural food. If the seasonal foraging behavior of wild elephants is known, this should ideally guide the type and timing of items presented. While it may be challenging

to obtain natural forage in large quantities, this training will be critically important for juveniles, and if the animals are intended for release into an area without existing elephants to observe. Exposure and habituation to cultivated crops, plants, fruits etc. should be stringently avoided, so as to avoid future crop-raiding inclinations. For animals that are expected to be released into areas where there is potential for agricultural conflicts, it may be possible and advisable to actively train avoidance of people, property, and crops through reinforcement techniques. It is strongly recommended that a professional specialist be consulted if such a training regime is being contemplated.

Health progress

Health indicators are an important means of documenting how well elephants are responding to the rehabilitation process. One of the obvious things which can be observed is the body condition score (BCS), for instance as described by Morfeld *et al.* (2016) and Pokharel *et al.* (2017). BCS of the rehabilitated or reintroduced elephants should be around 3-4, and occasionally up to 5, which means obesity. BCS lower than 2 can be assumed as poor nutrition, which can be from lack of food in the habitat, stress, poor adaptation to environment or group, high parasitic load, health problems, lack of foraging skills etc., which should be individually re-considered for further reintroduction. Dung composition is one of the simplest indicators for rehabilitated elephants, particularly when restraint or handling is not required. Dung composition should be fine, with no large material (e.g. trunk of grass, whole leaves etc.) observed which signals poor digestion. If wounds are observed throughout the body it should be determined whether they are due to underlying health concerns or behavioral issues (such as aggression from other individuals).

Planning the timing of Asian elephant reintroduction

The optimal release period depends on the areas and countries. Avoid harsh seasons when the temperature is too high, or periods with heavy rain. The release location should not be at risk of flooding or other hazards. Crop harvesting period should be avoided if possible, as this may attract elephants and lead to conflict in the earliest stages. Dry season may need to be avoided, as the foraging may be difficult, and elephants might suffer from lack of food and water. Reintroduction should take place following periods of rain, when the food and water is abundant, and they can forage and get accustomed to the surroundings easily. After determining the appropriate time of year, the weather forecast should be considered prior to scheduling the operation. The ideal time of day for release would be during the cool period i.e. at night or early morning.

Post-release period

Rationale

The post-release monitoring aims to answer a single critical question:

Which factors have a positive or negative influence on reintroduction success?

One may wish to break this down into the following smaller questions:

- Are the elephants in good physical health?
- What areas are optimal for the release? Are these areas safe?
- Are individuals integrating with wild counterparts socially?
- Can they forage successfully?
- What challenges are they encountering and are there any that could be avoided through prior training or exposure?
- What is the mortality rate and timeframe after release?
- For females, what is the reproductive rate?
- Are these elephants forming a cohesive social group?

Post-release monitoring should minimally involve tracking movements, and ideally also have a behavioral observation component if the release subjects are readily observable. The duration of time for post-release monitoring will of course depend on feasibility. As data are currently lacking, it is difficult to know how long animals require to assimilate to their surroundings. For adults, one may be able to obtain a good sense of how well individuals are faring within a year, when they have had the opportunity to be exposed to the range of environmental conditions. However, in order to be able to gauge survival and reproductive output, longer-term monitoring is preferable. This will be especially true for calves, which are both more vulnerable and undergoing developmental changes. A female released at age 5 may require 5-9 years before reproducing themselves. Therefore 1-5 years of monitoring would be a start, with more intensive efforts focused at the beginning, and periodic follow-up later on.

Intensive monitoring period (1-5 years)

All elephants should be intensively monitored, particularly in the first week, and later on once a week for one year in the first period. Assessment of the animals for injuries, wounds or clinical

symptoms of health problems should be performed from a distance. Body condition, injuries, wounds, deformities, lameness, dung, fGCM etc. should be monitored.

During the intensive monitoring period, movement data should be collected as frequently as is tractable, depending on the means of tracking, so that it allows inference of finer-scale behavior. If via satellite, this may be hourly. If via very high frequency (VHF), monitoring may only establish daily or coarse scaled movement, and GPS collar provides data from daily to hourly. The addition of accelerometers or other sensors to either type of collar could log data on movement vs. rest periods and alert observers to unusually long still periods indicating that the animal is in trouble.

If wild elephant groups are present in the released area, it should be considered to GPS collar one or several of the wild elephants (ideally one per group and adult male). Movement and/or behavioral observations may seek to document the following:

- Which areas do individuals use, and at which times of year?
- Do movements appear to settle down into a predictable pattern or defined area, indicating some level of stability, or are they erratic and dispersed?
- Are there problem locations?
- Does the amount of time spent moving, foraging, resting, etc. resemble what one might expect based on typical behavior for elephants in the area?
- What other individuals do they associate with (age, sex, identities if known)?
- Do they show preferential associations?
- What is the nature of their interactions with wild elephants (positive, negative, neutral)?
- What is the body condition?
- Do they engage in any problematic behaviors, such as approaching people or crop raiding?

If conducting a behavioral study, it would be valuable to record the behavior of wild individuals of the same sex and assumed age for comparison.

It is advisable to have close dialogue and engagement with local communities during this period, to address any concerns as quickly as possible.

Animals that exhibit problematic behavior may need to be monitored especially closely. Some behavior, such as approaching people, vehicles etc. may gradually resolve themselves and so long as there is no harm to the animal or people, may be tolerated. However, behavior that causes

risk to the animal or people may signal the need to intervene, possibly even remove the animal from the situation and re-evaluate its suitability for release.

Long-term basic monitoring (two or more years)

Long-term monitoring (two or more years) of the health of the released population as a part of the overall post-release monitoring program to look for chronic problems such as failure to reproduce or persistent weight loss. For longer term monitoring, movement data may be collected more sparsely. Additional data include:

- Social contact (age, sex, identities of companions)
- Reproductive state and any offspring, if observable. For females, the birth of calves and lactation are indicators of good health (Fig.6). For males, the onset and duration of musth can be taken as indicative of health.
- Injury, mortality, or disappearance.
- The number of elephants should be monitored in a long-term, as it should be defined and calculated a proper number of elephants to be released in that area; otherwise, the conflict between elephants as well as human and elephant could occur.

Communication with local communities should not be neglected in the long-term monitoring period as animals may learn new strategies over a prolonged period. Ongoing dialogue will be essential to keeping both people and elephants safe.



Fig 9: Group of released elephants with calves born from natural mating in the forest at Sub Lanka wildlife sanctuary, Thailand.

Lessons learned

Summary of mistakes and lessons learned from past reintroduction exercises

The unexpected can happen. It may occur after the elephants are released, in areas with or without wild elephants. The program may have tried its best to plan for every eventuality, but these things can still happen as elephants are smart, complicated social animals, and can present difficulties for humans, other animals or their habitat. Below we summarize past experiences.

Pre-release/Planning phase

Community awareness

When animals are released into an area, especially if wearing tracking devices that distinguish them from other wild elephants, the public may have questions about what they are doing there. In unfortunate cases where the animals may be seen among crops and plantations, they may be persecuted, as well as fuel rumor and misinformation. In communities surrounding Udawalawe National Park, the site at which many cohorts of juveniles were released from the adjacent Elephant Transit Home, surveys revealed that some people believed that crop raiding was driven in part by the release of as many as 500 animals into the protected area by authorities. Because crop-raiding adult bulls had also been translocated into the park from other locations, wearing similar collars, people also believed them to be part of the program. Therefore, they had very negative attitudes regarding the work of the ETH. In reality, fewer than 80 had been released at the time, all of which were juveniles. Given the vital importance of community sentiments to ensure that the released animals stay safe, it is advisable to communicate with them during the planning stages. Thus, public relations and community engagement around the forest are important.

When animals are released far from the care facility, follow-up monitoring may become more logistically challenging, but no less important. Lack of monitoring may not only lead to the death of the animals, but poor community relations and decreased morale among care staff. The follow-up monitoring plan should be integral to site selection and pre-release planning.

Rehabilitation phase

Over-habituation

At Udawalawe National Park, certain individuals from early cohorts of animals that were over-habituated sought out human company to the extent that they tried to find their way back to the

care facility, pestered safari vehicles or approached villagers for food and milk. In some cases, the behavior resolved when animals had their own calves; in other cases they had to be returned to the rehabilitation center, while some individuals unfortunately were known to have died. These behaviors may be personality-dependent but this does not mean such individuals are unsuitable for release – indeed, such individuals may be important to their social groups, for instance by taking on care-giving roles. Therefore, the protocol should be modified. Once the problem was realized by the Elephant Transit Home, effort was made to correct the process with later cohorts, under the minimal contact policy.

Post-release phase

Social support

When animals are released in mixed groups around the age of five, those that contain multiple individuals of the same sex, especially females are observed to do well, as the individuals remain bonded. Males at this age in the wild often still remain close to maternal associates, however reintroduced calves find it more difficult to integrate and therefore may wander large distances. This can expose them to both natural and man-made hazards over terrain that under normal circumstances they would have learned to navigate under the oversight of knowledgeable adults. In one instance, a released male calf ventured into quicksand-like mud and was fortunately spotted in time by authorities to be rescued. However, if males are kept under human care longer than their female counterparts and released at an older age, the possibility arises that they may again become over-habituated.

A possible means to overcome the lack of social support for males is to release same-sex cohorts rather than mixed-sex cohorts. Young males would then at least have the companionship of other familiar males from the care facility. Therefore, it is suggested that elephant calves need social life while undergoing rehabilitation to prevent these problems.

Maternal drive

Captive-reared sub adult females that are overzealous alloparents can at times become a liability in the wild intentionally or unintentionally, separating offspring from mothers while being unable to supply milk themselves. In such cases, especially when in possession of newborns that do not have a well-developed recognition of the mother, the calves may starve. It is difficult to anticipate or prevent this but be alert to indicators of this possibility during post-release monitoring. If individuals are accessible, intervention may be required to rescue the calf and return it to the mother. If the mother is unknown, the calf may itself require further human care.

Moreover, captive-born and released mothers may inadvertently injure or kill their calves if they lack maternal skills. Opportunities to observe and provide allo-mothering can provide valuable experience. It is of utmost importance to evaluate post-release outcomes with objectivity and acknowledge mistakes or failures with the honest intention of correcting them. Otherwise, the investments in all preceding stages are wasted.

Integration to the habitat and wild elephants

After releasing elephant calves to the wild, there is usually no harm from wild elephants they may encounter. Calves may be more easily accepted by wild elephants than adults. Some evidence showed that releasing of female elephants with calves could stimulate group formation from other previously released females (Angkavanish & Thitaram, 2012). One should keep in mind that elephant-elephant conflict (male-male, female-female, male-female) can occur, and result in deaths of elephants. On the other hand, it is also possible that released elephants not only survive in the wild, but that they become healthier with better body condition scores than previously. Physical condition as well as social acceptance may be important contributors to successful survival and reproduction in the wild for both males and females.

Conclusion

When elephants are released in a particular area, the goal is to ensure long-term persistence by integrating with existing wild populations or possibly seeding new populations. The rehabilitation of captive-born or orphaned wild elephants in human care for release back to the wild is a long and complicated process with many issues to consider. This includes not only thinking about the budget and co-operation from various organizations and stakeholders, but about what the elephants themselves truly need to be successful. All three stages - planning, rehabilitation, and post-release monitoring - are equally important. We hope this summary of guidelines helps to understand the various considerations for such a program.

Acknowledgements

The authors thank Dr. Christopher Stremme, Dr. John Edward, Dr. Christian Schiffmann, Dr. Ashoka Dangolla and Dr. Sanjeeta Sharma Pokharel for valuable comment on the manuscript, as well as Mr. Vivek Menon, Dr. Sandeep Kr. Tiwari, Ms. Prajna Paramita Panda and Dr. Taweepoke Angkawanish for their support.

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