# PASA Study on Reintroductions and Releases of African Primates:



**Understanding the impact of releases on primate conservation and determining the factors that contribute to their success**

**PASA Study on Reintroductions and Releases of African Primates: Understanding the impact of releases on primate conservation and determining the factors that contribute to their success**

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**Acknowledgements**

## Abstract

The Pan African Sanctuary Alliance (PASA) is a community of 23 wildlife centres across Africa that rescue and rehabilitate primates and other wildlife, often victims of the illegal wildlife trade. Many PASA members participate in the reintroduction of sanctuary-housed primates (here referred to as 'releases'), which can be an important tool in primate welfare and conservation. It is estimated that over the past 20 years, at least 35 reintroductions have been conducted by PASA member sanctuaries. To date little information about African primate releases has been published. The objectives of this collaborative pilot research project were to understand the impact of reintroductions on primate conservation and determine the factors that contribute to their success. A survey based on the IUCN Reintroduction Guidelines, as well as input of personal on-the-ground experiences, was developed and was sent to all PASA member sanctuaries conducting releases, present or past. The survey collected information regarding the sanctuary's strategies, planning, and operations release animals, veterinary programme, release site and area, and reintroduction events. Participating sanctuaries were Tchimpounga Chimpanzee Rehabilitation Centre (Congo), Centre pour Conservation des Chimpanzees (Guinea), Colobus Conservation (Kenya), and Lilongwe Wildlife Centre (Malawi). We identified a number of factors perceived by the sanctuaries to affect release

success and a number of challenges they face, including lack of funding and post-release human wildlife conflict. Importantly we also identified the need for standardised protocols for releases, particularly in terms of the data that is collected and reported on a release, and the need for objective measures of release success. This has allowed us to make a number of recommendations that will help standardise protocols and increase transparency and information sharing across PASA sanctuaries. As no information was provided on failed releases, we only have successful releases. We conclude with insights, similarities found within release strategies, challenges faced and best practices as indicated by the sanctuaries.

**Keywords** Primates, PASA sanctuaries, reintroduction, releases

## Introduction

The Pan African Sanctuary Alliance (PASA) is a community of 23 wildlife centres across Africa that rescue and rehabilitate primates and other wildlife, often victims of the illegal wildlife trade (Farmer, 2002). Many PASA members participate in the reintroduction of sanctuary-housed primates, which has the potential to be an important tool in primate welfare and conservation. Reintroduction is the process of releasing individuals into the wild from another site

and can be undertaken with the aim of achieving a number of different goals. Different terms are often used to describe reintroductions with different goals, such as 'welfare releases', 'conservation translocations' or 'population reinforcement'. The terms 'release', 'reintroduction' and 'translocation' are often used interchangeably by PASA member sanctuaries. Here we simply refer to them under the umbrella term, 'release'. This report is the first synthesis of primate releases from across Africa. Even though it doesn't include every release, we believe this is the first study of its kind.

Historically, welfare releases have been undertaken with the aim of improving the welfare of individual animals (Donaldson, 2017; Baker, 2002). These are typically undertaken by sanctuaries who wish to give individual animals a second opportunity at life in the wild and their goals are focused on individual animal welfare, as opposed to conservation-based (although the two are not necessarily mutually exclusive). As such, welfare releases are not recommended as 'reintroduction approaches' by the IUCN (Baker, 2002), who instead focus on conservation approaches. Releases can result in increased welfare for the individual by giving them access to a natural habitat and social environment, but many factors need to be considered, particularly with regards to whether the individual is likely to flourish or struggle upon return to the wild. It may be the case for some

individuals that have been subject to injury or emotional trauma that the most appropriate welfare decision may be a lifetime of specialised captive care.

In addition to considerations of individual welfare, releases from sanctuaries also allows for increased capacity to take in injured and/or orphaned individuals. This is a particularly important consideration given that the intake of PASA member sanctuaries has been increasing over recent years (Faust et al., 2011; PASA Census Report, 2019) and with increasing pressures of wildlife, pet, and bushmeat trade, is predicted to increase further in the future. By releasing healthy individuals to the wild, sanctuaries are then able to accept other individuals who are often confiscated from the illegal pet and bushmeat trade, or from poor-quality zoos/private collections, and require urgent care.

Conservation translocations are aimed at supplementing declining wild populations, either by reintroducing individuals into an existing population, or by reintroducing them into the historic range of that species that is currently unpopulated. These reintroductions are therefore particularly important to endangered species, such as great apes (Humle et al., 2011; Campbell et al., 2015) and the long-term viability of the reintroduced population is of the utmost importance.

While release can be an important tool in achieving both welfare and conservation aims, it is also a complex and difficult process. There have been a number of releases that have been well-documented and appear to boast high survival rates, with species such as chimpanzees (Farmer et al., 2006; Tutin et al., 2001; Humle et al., 2011; Moscovice et al., 2010), gorillas (King et al., 2011) and gibbons (Osterberg et al., 2015), golden-lion tamarins (Kierulff et al. 2012, although see Dietz et al. 2019). However, the success of other releases is either hard to quantify or estimated as being relatively low (Guy et al. 2012; Meijaard et al., 2012). For instance, since the 1970s, hundreds of orangutans have been releases to the wild, but the success of these releases is not clear (Meijaard et al., 2012) and a number of releases of vervet monkeys in South Africa have resulted in either low or unknown survival rates (Wimberger et al., 2010; Guy et al. 2012).

A great number of factors need to be considered when planning a release and success is far from guaranteed. Factors such as release location, individual suitability for release, interaction with existing populations, disease transmission, and the availability of resources to monitor individual long term can all influence the success of a release (Baker, 2002). One of the most resource-demanding aspects of release is long-term monitoring and unfortunately few reintroduction programs have monitored released individuals for 12 months or

longer (Guy et al. 2013). This can be due to a lack of financial resources, or difficulties in tracking non-collared individuals across challenging terrain and means that the long-term outcome of the release is unclear (Guy et al. 2013). For example, due to difficulties in tracking reintroduced orangutans, estimates of mortality range from 20-80% (Russon, 2009). This ambiguity about long-term success makes it unclear whether it is advisable to replicate these procedures for future releases. In addition, many successful releases have involved extensive post-release care, including initial food provisioning, medical intervention (Humle et al., 2011) and reuniting individuals after group splits (Humle et al., 2011); activities which all require intensive investment.

A further problem to consider is that captive-born, or raised, individuals may not be able to display behaviours that are necessary for survival in the wild. Many primates in PASA member sanctuaries have been rescued from the illegal wildlife trade, kept as pets, used for entertainment, or kept in terrible conditions in private collections or low-standard zoos (Faust et al., 2011). Some arrive as young orphans, while others arrive as adults, having spent years in unsuitable conditions. The individuals therefore have often been unable to learn crucial survival skills from their mother and conspecifics and/or have endured significant trauma that effects their ability to display behaviours that are crucial to survival in the

wild.  This can be particularly important for great apes with extended adolescence, who would ordinarily learn a vast number of complex behaviours from their mothers in order to survive independently (Schuppli et al., 2016). It has become clear that some released orangutans struggle to readjust to life in the forest and fail to show appropriate wild-type behaviours necessary for long-term survival (Grundmann, 2006). Making sure an individual is suitable for the wild is therefore crucial to release success and requires thorough individual assessment and effective rehabilitation procedures (Baker et al. 2002).

The existence of wild populations in the release area can also cause problems as they may present threats to released individuals, or vice-versa. In a chimpanzee reintroduction in Republic of Congo, several male rehabilitant chimpanzees were seriously injured by their wild counterparts following release (Goosens et al., 2005). Conversely, the females released in this same reintroduction survived well and transferred to wild groups. This highlights the complex nature of releases; some individuals of the same species may fare better under certain release conditions than others. Interestingly, aggression from wild individuals did not appear to be replicated in a chimpanzee release in Nigeria (Humle et al., 2011), suggesting that outcomes may differ based on factors that cannot be easily predicted.

Disease transmission is also a significant risk and it is crucial that every care must be taken to ensure released individuals do not spread disease to a wild population (Baker, 2002).

In order to maximise consistency and successful outcomes in primate releases, the IUCN have published best practice guidelines for the reintroduction of primates (Baker, 2002), as well as more specific guidelines for reintroductions of great apes (Beck, 2007) and gibbons (Campbell et al., 2015). These guidelines provide best practice suggestions based on reviews of historic cases and input by a range of field specialists (Baker, 2002). The guidelines highlight key factors that need to be considered when preparing for a reintroduction that can be grouped into six sections: (1) the precautionary principle, (2) planning & preparing for re-introduction, (3) disease risk & veterinary requirements, (4) transport & release strategy, (5) post-release monitoring, and (6) considerations for translocation. The six sections contain detailed guidance on each stage of reintroduction and by adhering to these guidelines, organisations can theoretically optimise the success of their releases.

The precautionary principle is as follows: 'The uncertainty surrounding potential threats to the environment has frequently been used as a reason to avoid taking action to protect the environment. However, it is not always possible to have clear

evidence of a threat to the environment before the damage occurs. Precaution – the "Precautionary Principle" or "Precautionary Approach" – is a response to this uncertainty.' (IUCN Council, 2007). "If there is little conservation value in releasing primates to the wild, or no management programme exists in which such a release can be undertaken according to conservation guidelines, the possibility, however unlikely, of inadvertently introducing a disease or behavioural or genetic aberration not already present in the environment should rule out implementation of a re-introduction or translocation programme." (Baker, 2002).

However, it is currently unclear to what extent these guidelines are being adhered to by all sanctuaries conducting releases, with some research suggesting that these guidelines are not always followed (Guy and Cumoe, 2013, although note that many of those reviewed here were releases of Asian or Latin American species of primates). Indeed, one crucial problem identified in this review of primate releases was a lack of data being shared that could help improve future releases (Guy and Cumoe, 2013). To that end, the aim of this report is to identify how closely range-state sanctuaries have been able to adhere to the IUCN guidelines when conducting releases and to supplement these guidelines by sharing data on the release procedures and outcomes at PASA member sanctuaries. Collecting data about every aspect of the release process is extremely useful in

assessing which factors affect success and in assessing how reintroductions can be made consistent across sanctuaries, and whether sanctuaries have the resources and capacities to do this.

## Objectives

Over the past 20 years, at least 36 reintroductions have been attempted by PASA member sanctuaries.

However, to date little information about African primate reintroductions has been published. The objectives of this collaborative pilot research project were to understand the impact of releases on primate conservation and determine the factors that contribute to their success, including the aim for the production of a peer-reviewed paper.

## Methods

In July 2019 invitations were sent to 8 PASA sanctuaries who actively participate or have participated in reintroductions/releases for great apes and monkeys. The invitation letter specified the objectives of a collaborative research project aimed at understanding the impact of releases on primate conservation and determine the factors that contribute to their success, including the aim for the production of a peer-reviewed paper.

Participating sanctuaries were Tchimpounga Chimpanzee Rehabilitation Centre (Congo), Centre pour Conservation des Chimpanzees (Guinea), Colobus Conservation (Kenya), and Lilongwe Wildlife Centre (Malawi). Participation of some sanctuaries was postponed due to time constraints and perceived conflict with independent academic publishing. The data collection was concluded in March 2020.

A survey based on the IUCN Guidelines as well as input of personal on-the-ground experiences was developed in a Word format as internet access can be challenging and cumbersome. The survey was translated into French and English and consists of mainly predetermined questions in multiple choice and bulleted format to make filling in as easy as possible. It also had space to add in any other related and vital information which was deemed necessary in open text boxes.

The survey collected information regarding the sanctuary's strategies, planning, and operations, reintroduction animals; veterinary programme; release site and area; and reintroduction events.

Sanctuaries were asked if they wanted to keep their data confidential. All agreed to have the data published. No ethical approval was necessary for this pilot research project.

## Analyses

Due to the size of our sample, we were unable to perform traditional inferential statistics.  Instead we provide qualitative results and descriptive statistics on questions asked in out questionnaire.

## Results

Four sanctuaries responded with completed questionnaires. One of the sanctuaries reported to have conducted five different troop releases using the same methodologies: they therefore completed one questionnaire to represent all five releases. Another sanctuary provided two questionnaires; one was filled in for a troop release, the other questionnaire contained information on both single animal releases and annual troop releases. Information on the single releases was very limited and was therefore omitted. A third sanctuary had released one troop of animals and the fourth sanctuary reported the release of two different troops. For one troop extensive information was provided, however, for the second

released troop no further information was given. Therefore, this troop release was excluded from the data set.

In total 10 different releases were distinguished from all received questionnaires. All of these were troop releases that used, or partially used, a soft release strategy. Some animals were released wearing collars and were followed by GPS tracking.

Challenges with collars have been reported in other reports and experiences such as collars being too big in size and weight for the species, as well as the costs associated with them. In order to track animals, collars were placed on some of the animals prior to release within all released troops. Considerations that were made by sanctuaries on which type of collar to use included: weight, flexibility belting, external antenna, battery life and rot-off parts.

Animals that received collars involved adult males and females in general. One release of vervets involved collaring all individuals released including younger animals. For 50% of the releases the sanctuary did not indicate which collar was used during the releases. One release of vervets used a mammal zip tie collar with an average battery life of 502-897 days. This same sanctuary also released vervets using GSM-GPS collar with a battery life of 2 years. Problems encountered with the collar included: difficulties with satellite

readings during cloudy days and significant decrease of battery life with more readings.

One release (chimpanzees) indicates they used collars to monitor them safely at a distance and used GPS/Argos ballast collars for males, and GPS/Store on board for females with offspring, and VHF collars for low ranking females. They tested the animals 6 months prior to release with dummy collars, still one female removed her collar in transport cage before release.

A release of mandrills used GPS collars, and VHF GPS collars in the big males (Telonics, GPS Argos) and VHF collars in females (Telonics). The main reason to collar animals was to understand what would happen to the group once released, such as would they disperse, go close to human habitation, forage in the right locations.

One release (vervets) used the Mammal zip tie collars (supplied by Advance Telemetry Systems, model number: M1555), the collars are GSM-GPS collars with a battery life of two years.

The collars were working fine and were able to give monkey location coordinates twice a day (5:00 am and 2:00pm). Problems encountered were satellite readings whenever there was a lot of cloud cover, and the battery life also decreased significantly if more readings were sent.

The reported species include Sykes monkeys (*Cercopithecus albogularis*), vervets (*Chlorocebus pygerythrus*), yellow baboons (*Papio cynocephalus*), mandrills (*Mandrillus sphinx*) and chimpanzees (*Pan troglodytes*). In total 165 animals were released of which 82% are listed as 'least concern' animals by the IUCN (Figure 1A). The number of animals included in each release ranged from 5 to 25, with a mean of 16.5 (Fig 1B).
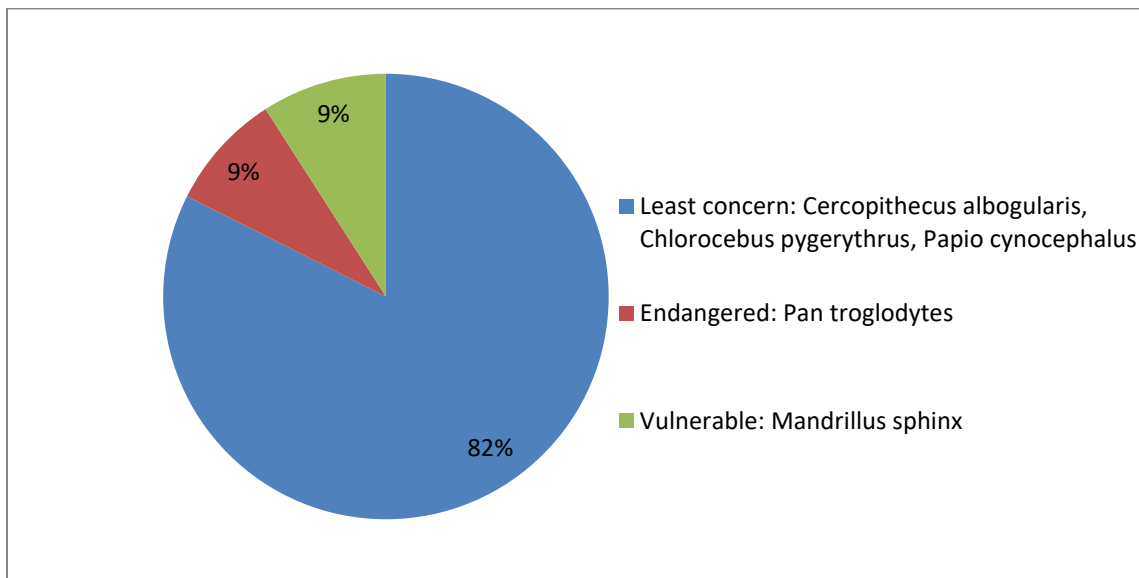


**Figure 1A Total percentages of released animals per IUCN Red List category**
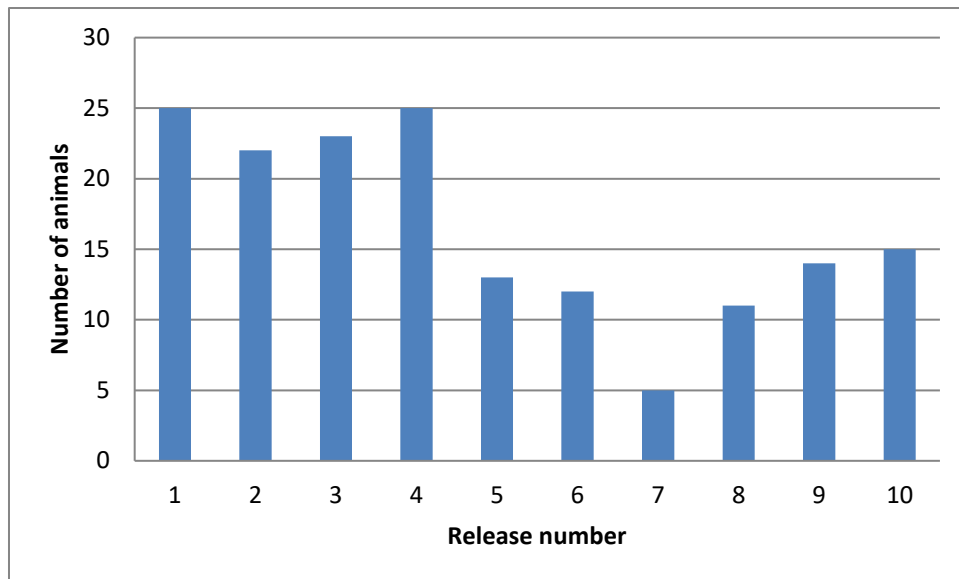
**Figure 1B Total number of animals released per release.**

*Strategies, planning and operations*

The IUCN guidelines on primate releases can be grouped into six sections: the precautionary principle, planning & preparing for re-introduction, disease risk & veterinary requirements, transport & release strategy, post-release monitoring, and considerations for translocation. For each of these six sections, the sanctuaries were asked:

"Use a scale from 1-5 to indicate how much of these principles/guidelines you apply when releasing animals:

1 = 0-20%    2 = 20-40%       3 = 40-60%       4 = 60-80%       5= 80-100%"

For 8 out of 10 animal releases, the sanctuaries' own guidelines were used, in addition to the IUCN guidelines. All sanctuaries reported that they complied with the 'post-release monitoring guidelines' from the IUCN in the highest capacity (80-100% indicated for all 10 releases, see Figure 2). The 'planning and preparing for re-introduction' guideline comes second; sanctuaries reported complying with these guidelines 80-100% for 8 out of 10 releases. 'the precautionary principle' (is the guideline of which most sanctuaries indicated the least complicity with (40-60% for 7 out of 10 releases). Only one release (number 5) reported complying with all six sections of the guidelines at a high level (80-100%). Release number 9 (endangered species) and 10 (vulnerable species) reported the least compliance overall with IUCN guidelines.

Figure 2 shows an overview of indicated compliance with IUCN guidelines per release per principle/guideline. One release (nr 6) complied the most with all IUCN guidelines. Release number 9 (endangered species) and 10 (vulnerable species) show the least compliance overall.
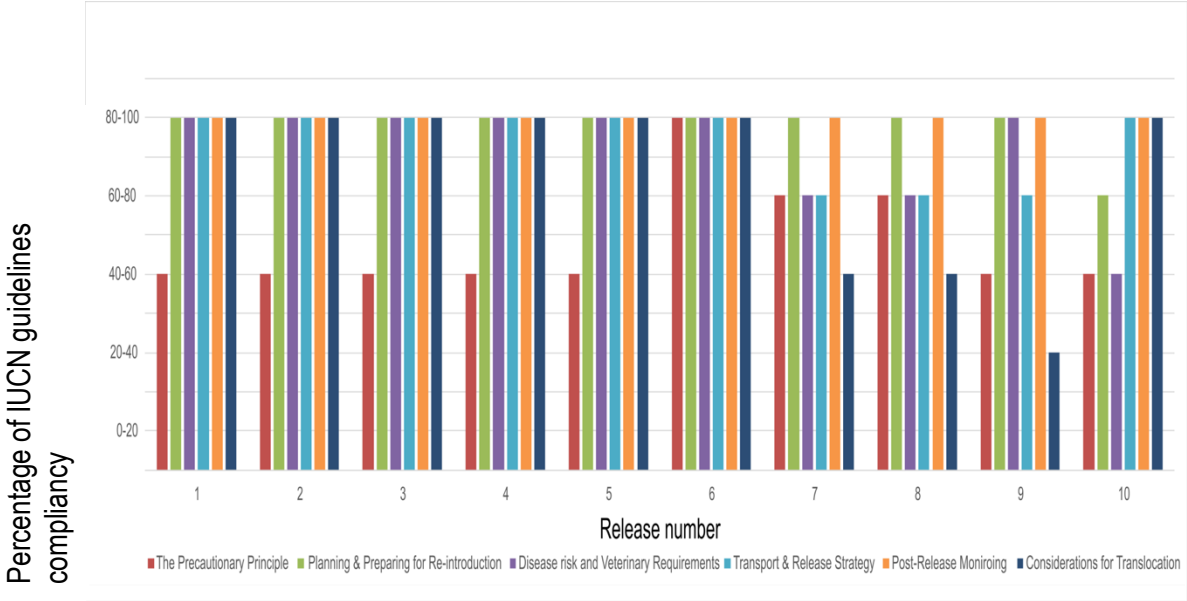
**Figure 2 Level of Compliance with IUCN guidelines in percentages per release.**

The questionnaire also asked whether the release fell within one of the established classification options, listed in Table 1.

**Table 1: Classification options for releases. Respondents were asked to select which of the classifications their releases fell under.**

| Nr. | Classification option explanation |
|---|---|
| 1 | Population restoration: reinforcement (conspecifics are present in release area) |
| 2 | Population restoration: reintroduction (conspecifics are not present in release area) |
| 3 | Conservation introduction: assisted colonisation (to avoid population extinction of focal species at any scale) |
| 4 | Conservation introduction: ecological replacement (to bring back ecological functions that have been lost through extinction) |
| 5 | Releases for sake of animal welfare and/or rehabilitation from captivity |
| 6 | Population reinforcement for recreational/commercial offtake |
| 7 | Reinforcement mitigation translocations: removal of organisms from habitat, due to human facilitated land use change and release in alternative site where conspecifics are present |
| 8 | Reintroduction mitigation translocation: removal of |

| | |
|---|---|
| | organisms from habitat, due to human facilitated land use change and release in alternative site where conspecifics are NOT present (anymore) |
| 9 | Conservation introduction mitigation translocation: removal of organisms from habitat, due to human facilitated land use change and release in alternative site that cannot qualify as within indigenous range |

All sanctuaries indicated that all releases fell within the IUCN established classification, shown as option 5 in Table 1: 'releasing animals for animal welfare reasons and/or rehabilitation from captivity'. Respondents were asked to rate the importance of each classification to each release: for 90% of the releases animal welfare and/or rehabilitation from captivity (number 5, Table 1) was perceived as most important (respondents score: 5 on Likert scale 1-5) which can be seen in Figure 3. Population restoration and reinforcement mitigation translocations were also listed as important in a minority of releases (Fig 3).
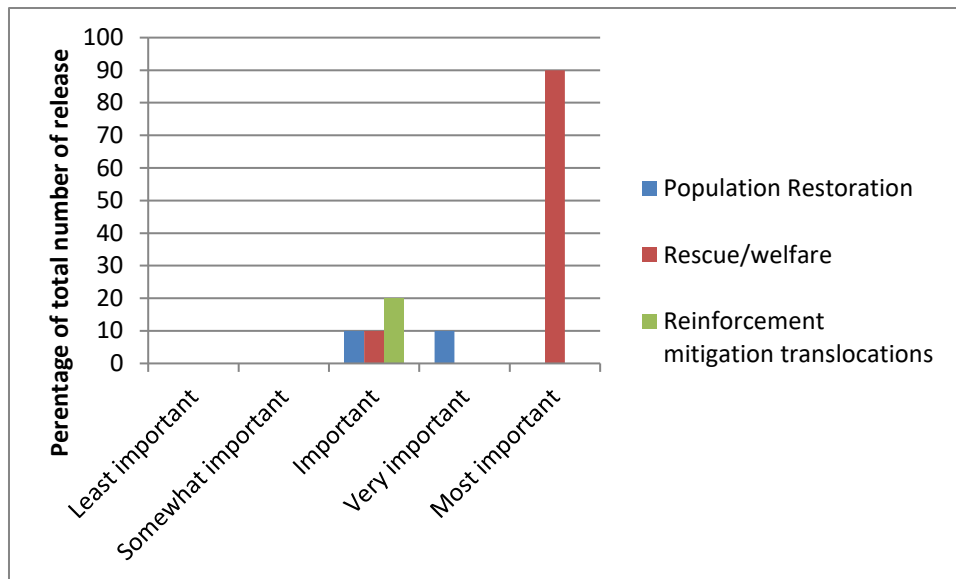
**Figure 3 Perceived importance of the 'release classification'**

Respondents were then asked to select the goals/objectives of the reintroduction from the list shown in Figure 4.

Included in the objectives of 100% of reintroductions was, 'Enhancing the psychological or physical well-being for individuals' and included in the objectives of 50% was 'Promoting conservation awareness'. One release (10%) that involved chimpanzees aimed to 'supplement a wild population' and this same release also aimed to 'Enhance genetic variation of a taxon (Figure 4 and Table 1). Maintaining or restoring natural biodiversity was mentioned as a goal/objective for 30% of the releases and 20% indicated enhancing protection and law enforcement efforts.

**A** Re-establishing a wild population in an historical range area
**B** Supplementing a wild population
**C** Re-establisihing a flagship species
**D** Maintaining or restoring natural biodiversity
**E** Enhancinng genetic variation of a taxon
**F** Promoting conservation awarenes
**G** Enhancing psychological or physical well-being for individual animals
**H** Enhancing protecton and law enforcement efforts
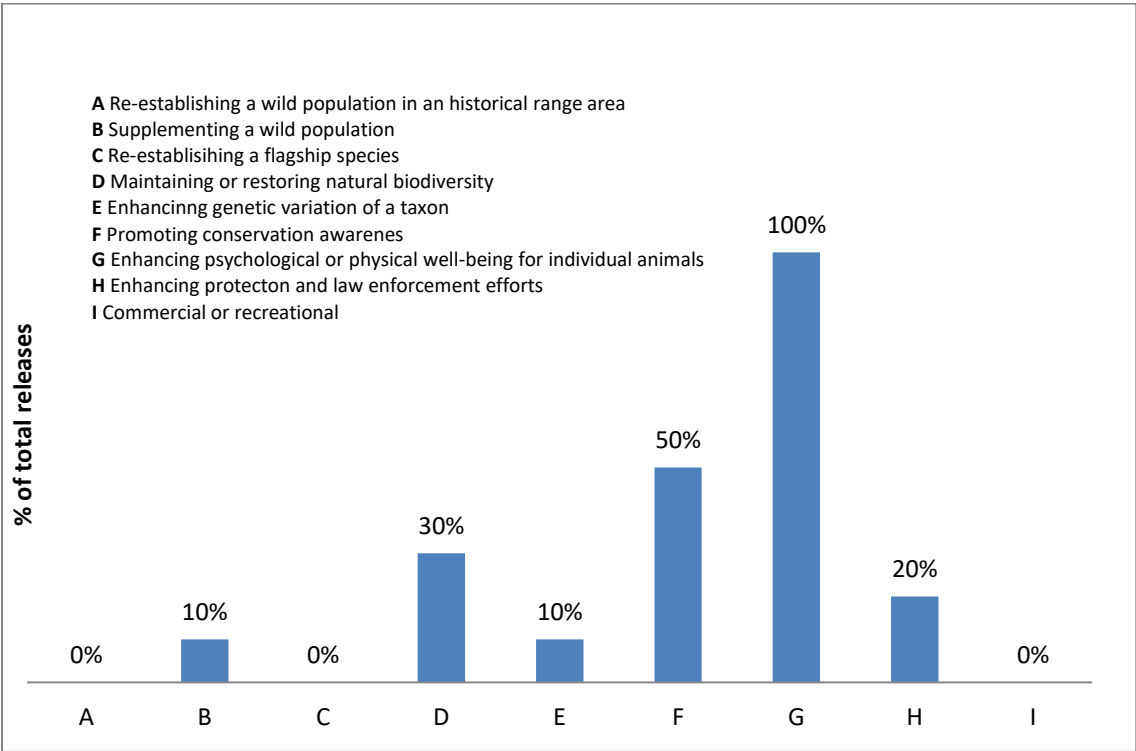**I** Commercial or recreational

**Figure 4 Goals and objectives for pursuing reintroductions.**

Table 2 provides an overview of goals and objectives per release including the classification of the species released. Some evidence was found that having a goal and/or objective on promoting conservation awareness influences the outcome of a release positively.

**Table 2 Overview of goals & objectives per release & classification of released animals (IUCN red list April 2020)**

| Release | Main goals & objectives | Released animals |
|---|---|---|
| 1 | Enhancing psychological or physical well-being for individual animals | Least concern *Chlorocebus pygerythrus / Papio cynocephalus* |
| 2 | Enhancing psychological or physical well-being for individual animals | Least concern *Chlorocebus pygerythrus / Papio cynocephalus* |
| 3 | Enhancing psychological or physical well-being for individual animals | Least concern *Chlorocebus* |

| | | |
|---|---|---|
| | | *pygerythrus / Papio cynocephalus* |
| 4 | Enhancing psychological or physical well-being for individual animals | Least concern *Chlorocebus pygerythrus / Papio cynocephalus* |
| 5 | Enhancing psychological or physical well-being for individual animals | Least concern *Chlorocebus pygerythrus / Papio cynocephalus* |
| 6 | Promoting conservation awareness Enhancing psychological or physical well-being for individual animals | Least concern *Chlorocebus pygerythrus* |
| 7 | Maintaining or restoring natural biodiversity Promoting conservation awareness Enhancing psychological or physical well-being for individual animals | Least concern *Cercopithecus albogularis* |
| 8 | Maintaining or restoring natural biodiversity Promoting conservation awareness Enhancing psychological or physical well- | Least concern *Chlorocebus pygerythrus* |

| | | |
|---|---|---|
| | being for individual animals | |
| 9 | Supplementing a wild population | Endangered |
| | Maintaining or restoring natural biodiversity | *Pan troglodytes* |
| | Enhancing genetic variation of a taxon | |
| | Promoting conservation awareness | |
| | Enhancing psychological or physical well-being for individual animals | |
| | Enhancing protection and law enforcement efforts | |
| 10 | Promoting conservation awareness | Vulnerable |
| | Enhancing psychological or physical well-being for individual animals | *Mandrillus sphinx* |
| | Enhancing protection and law enforcement efforts | |

## Finances and funding

While two releases were funded by internal funding only, the majority of the releases (70%) were possible through a combination of internal and external funding. One release was 100% externally funded.

Respondents were asked, "What would have been done differently if there had been more funding?" Major points for improvements were reported if the projects had more funding available. One sanctuary

reported that financial constrains resulted in the release of animals in an area that are more prone to human-wildlife conflicts due to the urban nature of the release site. Although animals originally came from this area, releasing the animals in an urban area, from an area where the animals also originated from, did result in human-wildlife conflicts for multiple projects. Preferably releases would take place in national parks or other more natural areas.

For another release the fencing of the pre-release enclosure burned down and no additional funding was available to rebuild it. This led to the dispersal of the animals directly after release. Sanctuaries also reported that more equipment would have been purchased to improve communication, transportation and data collection.

### Team

To further understand the quantity of personnel and diversity of skills required to conduct a release, the sanctuaries were asked about the people involved and about any challenges experienced with the release team. The number of people involved ranged from approximately 9-35. For most releases the team comprised of a combination of directors, managers, veterinarians, caretakers, students and volunteers. Each person was assigned with a different task throughout the release process.

Challenges faced with regards to the team were reported in 40% of the releases. Time spent on training was reported in 3 of these releases, a lack of human resources & funding (one release), and some personnel having no experience in tracking animals (one release). This resulted in fewer data acquired then anticipated in 30% of the releases, and a loss of the radio tracking signal and therefore an inability to track the animals for another release (chimpanzees). Data reading and interpretation skills was available in all teams. For 60% of the releases no challenges were reported with regards to the team.

### *Troop formation*

Troops of releasable animals were established by senior managers and directors at sanctuaries. The number of animals per release ranged from 5-25 individuals. In 30% of the releases, sanctuaries reported that number of individuals per troop chosen was based on naturally occurring troop size in the release area and readiness for release. For 5 out 10 releases the sanctuaries did not mention why the specific number of animals were chosen per release. The remaining 20% indicated that the number of animals per troop released was based on the number of individuals at the sanctuary.

Sanctuaries were asked about the specific individual indicators that could be used to form troops, listed in Fig 5. Both 'individual

character & relationship' and 'medical situation' were reported as being used with all releases when making changes to a troop (Figure 5).
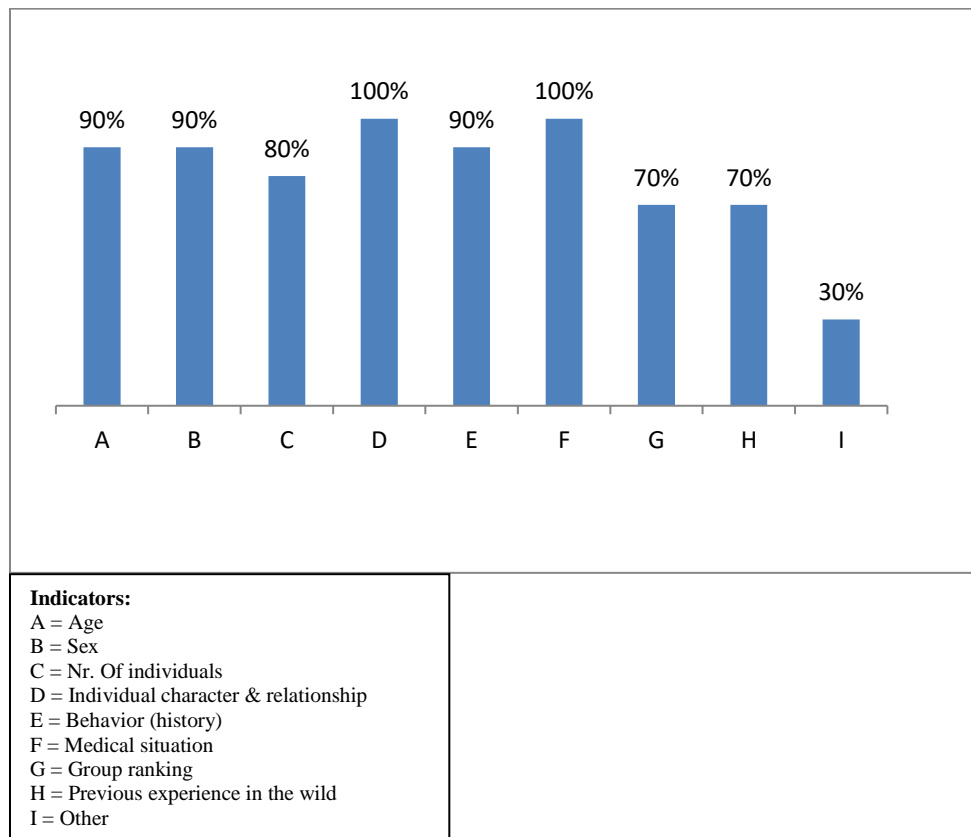


**Indicators:**
A = Age
B = Sex
C = Nr. Of individuals
D = Individual character & relationship
E = Behavior (history)
F = Medical situation
G = Group ranking
H = Previous experience in the wild
I = Other

**Figure 5 Percentage of releases that use specific individual indicators to establish groups of animals.**

Other reported indicators that were added were by respondents were whether individuals were infants, and whether individuals had passed all required pre-release training assessments. One release that involved chimpanzees used three indicators (none from our provided list) to establish troops of animals compared to the other releases that used 7 or 8 indicators (Figure 6).
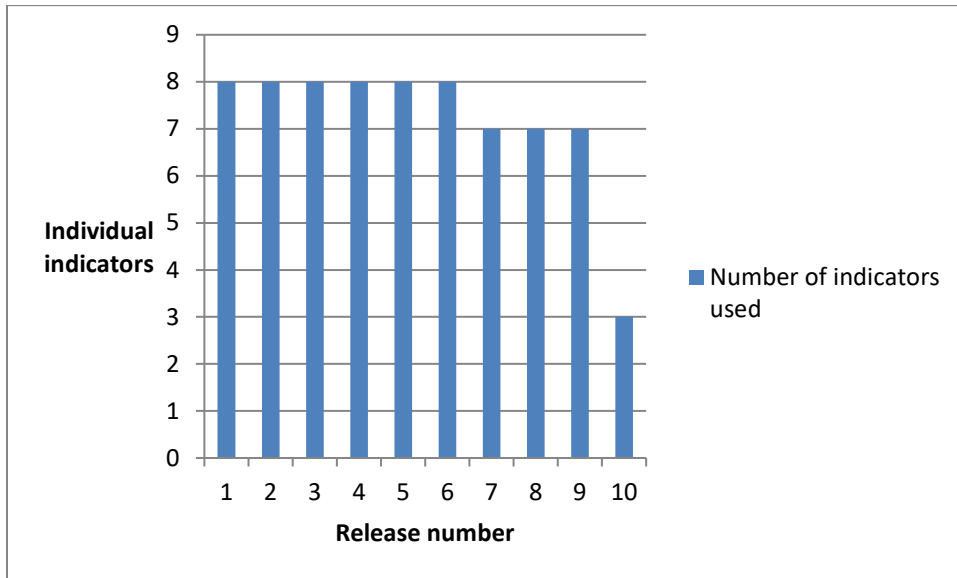
**Figure 6 Number of individual indicators used in order to make changes to a troop per release.**

The time needed to establish troops ranged from 0-1 year (20%), 1-2 years (60%), 3-4 years (10%) and other (10%). The amount of time that animals were living together prior to release ranged from 0-1 years (20%), 1-2 (20%) years, 2-3 years (50%) and other (10%).

"Other" was indicated for the release of the troop of chimpanzees, the animals had been living together since they arrived at the sanctuary and were also released together, and the time spent together surpassed 10 years, however, this troop dispersed directly after release and did not come back to their enclosure for food.

We also asked the respondents how social considerations within groups were analysed. In 90% of the reported releases, behavioural observations on animal interactions were analysed in order to analyse group cohesion, in 90% of the reported releases. In one release involving vervet monkeys, social network analysis was used by looking at the frequency of pair-wise interactions of social proximity, grooming and social contact on group and individual levels, but no further information was provided on how this was used.

### Veterinary care

All animals were reported to have received veterinary screening prior to release. This was most elaborate within one release where 28 different tests were performed per each chimpanzee. Testing for hookworm (100%), balantidium coli (70%) whipworm (90%), pinworm (80%) and tuberculosis (100%) was completed for most releases. If animals tested positive, they were treated accordingly and continued to be released. Sedatives or calming products were not reported to be used during the transportation part of any of the releases.

### Individual & troop releasability testing

Sanctuaries were asked to report which of the following tests were used in order to assess whether individuals and troops are ready for

release: individual body condition, abnormal behaviour, predator awareness tests, ability to forage, sleeping behaviour, rank, physical disability, and medical situation. The respondents reported that with 80% of the releases all indicators were used to test individual animals on their releasability (Figure 7). With most releases (90%) 7-8 indicators are used when testing individuals on their readiness for release. One release involving *Mandrillus sphinx*, classified as vulnerable, used 4 out of 8 indicators, and rank was the least frequently used assessment (80% of releases).
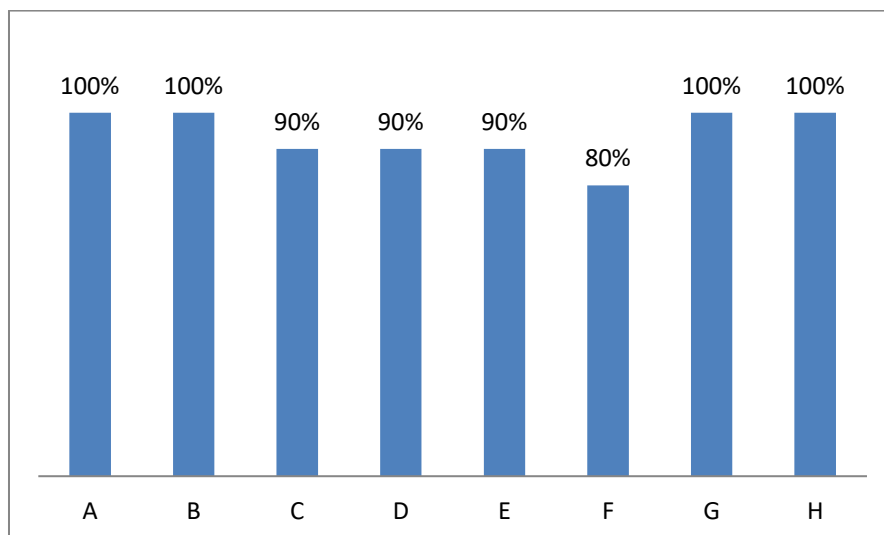


Indicators:
A = Individual body condition
B = Abnormal behavior
C = Predator awareness tests
D = Ability to forage
E = Sleeping behavior
F = Rank
G = Physical disability
H = Medical situation

**Figure 7 Percentage of releases that use individual indicators to test releasability.**

The following indicators are used to test individual releasability by all releases: individual body condition, showing abnormal behaviour, physical disability and medical situation. Animals that were deemed unfit for release were integrated in other troops or kept as a surrogate mother at the sanctuary. One sanctuary mentioned that they regularly take animals out of the troop prior to release when they are deemed unfit. Two sanctuaries mentioned that taking out animals impacted the dynamics of the troop and the animals needed time to re-establish their dominance hierarchy.

### Releasability testing & training

We asked respondents what tests or strategies were applied to train/test animals prior to release. Group cohesiveness was mentioned for all releases to be a key indicator, although not every respondent indicated how this is measured. Approaches to measuring group cohesiveness were reported as including performing group scans, scan sampling behavioural data, data collection of social behaviour and interactions, and social network analysis. Other reported indicators for a troop/group to be releasable include good health (80%), stable dominance hierarchy (50%) and the ability to respond appropriately to threats (30%). While this last percentage seems low, it was only reported in 3 out of 10 releases that appropriate response to threats was used as an indicator to

determine whether a troop is releasable or not. It was not mentioned if numerical measure of group cohesiveness was used as a criterion.

We also asked whether the following predator awareness tests were conducted: snake, big cat, dog human. Snake, big cat and human tests were reported in 40% of releases and dog awareness tests were reported in 30%. One sanctuary also reported baboon and electrical wire awareness testing which contributed to 30% of the releases.

Individual releasability training in of responding appropriately to predators and corresponding awareness tests were also done. These questions are slightly different to question related to responding appropriately to threats, expecting to result in overlapping answers, but which is not the case. In general, if you look at troop releasability testing and predator awareness testing, both are relatively low to what you would expect them to be in order to base release decisions on. The big cat awareness test showed to have an influence on the success of a release.

The foraging behaviour of the animals prior to release was analysed in a number of different ways by the different sanctuaries: respondents reported the use of general observations without quantification, conducting tests, and extensive pre-release instantaneous recordings. The implementation of different feeding

strategies was reported for 20% of the releases in order to prepare animals for their release. These strategies included the addition to their diets of wild plant and fruits that naturally occur in the forest.

## *Release site*

In order to find a suitable release site, sanctuaries reported using a range of different analyses and surveys. Release site analyses of food availability, types of food and human population were done for all releases. Population, water source, and sleeping site assessments were performed in 80% of releases. Two releases (20%) conducted analyses on carrying capacity, human livelihoods, and human attitudes to the release/species. The chosen release sites for the releases varied in terms of size, surrounding area, ecological borders and distance from the sanctuary. Table 2 shows that 70% of the releases took place in national parks. There were large differences in reported sizes of release site; release site size was reported with a minimum of 2 acres and a maximum of 2200 km$^2$. In 80% of the releases the release site area has some sort of fencing. Traveling distance from the sanctuary to the release site varied between 0 hours (30%), 4-10 hours (50%), to 6-7 hours (10%). One respondent did not indicate how long their travelling distance was.

Travelling distance to national borders was indicated to be 15 km for the release of least concerned animals, to roughly 30 km for vulnerable species, to hundreds of km for endangered species.

**Table 3 Release site types**

| Release number. | Distance from sanctuary | Release site size | Fencing | Surrounding | Distance to national border | Ecological border | Others |
|---|---|---|---|---|---|---|---|
| 1-5 | 4-10 hours | Between 2,200 km$^2$ and 986 km$^2$ | Partly | National park, villages | 15 km | - | Some poaching pressure |
| 6 | 0 hours | Unlimited | Yes | Forest | - | Ocean | |
| 7 | 0 hours | 2 acres | Yes | Residential properties | 100 km | Ocean, 200 m | |
| 8 | 0 | 2 acres | Yes | Residenti | 100 km | Ocean, | |

| | hours | | | al propertie s | | 200 m |
|---|---|---|---|---|---|---|
| **9** | - | 5-8 km$^2$ | No | National Park | Over 100 km (hundred s) | Forest |
| **10** | 6-7 hours | - | No | National park, Villages | +/- 30 km | - |

Table 4 shows the pros and cons indicated by respondents about each release site. The potential for human-wildlife conflict was reported for 30% of the releases, due to the release site surroundings. Poaching pressure was reported as a con for 50% of the releases. The proximity of a river to the release site of the chimpanzees (release number 9) was indicated as a positive aspect of the release area. However, it was also stated as a potential negative aspect, due to the concern that animals could cross the river during the dry season.

**Table 4 Pros and cons by each release.**

| Release number | Pros | Cons |
|---|---|---|

| | | |
|---|---|---|
| 1-5 | Protected area, presence of conspecifics, suitable habitat (abundance of food, water, sleeping sites), low predator abundance | Poaching pressure |
| 6 | No resource competition for animals<br>Easy monitoring (due to location)<br>Veterinary care & rescues prompt | Residential properties nearby (human-wildlife conflict) |
| 7 | Easy monitoring (due to location)<br>Veterinary care & rescues prompt | Human-wildlife conflict |
| 8 | Easy monitoring (due to location)<br>Veterinary care & rescues prompt | Human-wildlife conflict |
| 9 | River nearby | Potential crossing river during dry season |
| 10 | - | - |

## Reintroduction event

In 50% of the releases, animals were kept for 15 days within a pre-release enclosure within the release site. One release (10%) kept mandrills in the pre-release enclosure for 180 days. This was done in order to determine the animals' habituation time by checking the cortisol levels in their stool.

With the release of a troop of chimpanzees, the males were kept for 2 months in the –pre-release enclosure while the females were released directly after being transported. Although it was initially planned to have the females with the males in a pre-release enclosure prior to release, this enclosure burned down. In the remaining 30% of the releases, animals were released directly from their rehabilitation site and therefore no acclimatization period in a pre-release enclosure was needed. With these direct releases, involving Sykes and vervet monkeys, additional costs and problems perceived with regards to transportation were kept to a minimum. Without the need to transport animals for release, stress-related behaviours associated with their preparation for transportation and the journey were avoided in these direct releases (release numbers 6-8 in Figure 8). For release number 9 is the only release which indicates that reassurance from caretakers was needed in order to support the animals.
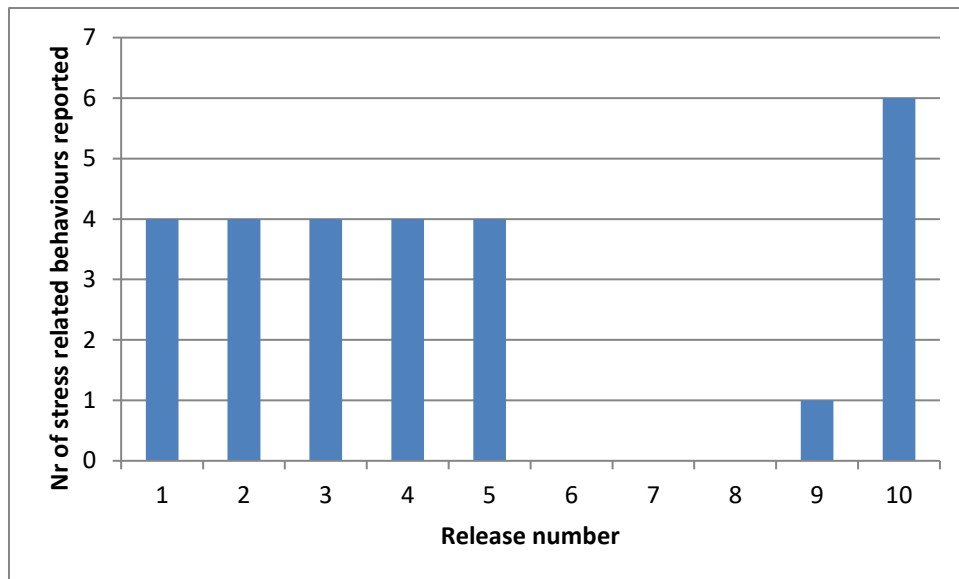
**Figure 8 Total amount of stress-related behaviours observed after catching for release event.**

The sanctuaries that did need to catch animals for release reported a number of stress-related behaviours, including increased threats and aggression to conspecifics and increased pacing behaviours (Figure 9). Measures that were taken to reduce stress levels during catching and transportation included the involvement of a minimum number of people, noise reduction, and transportation at night.
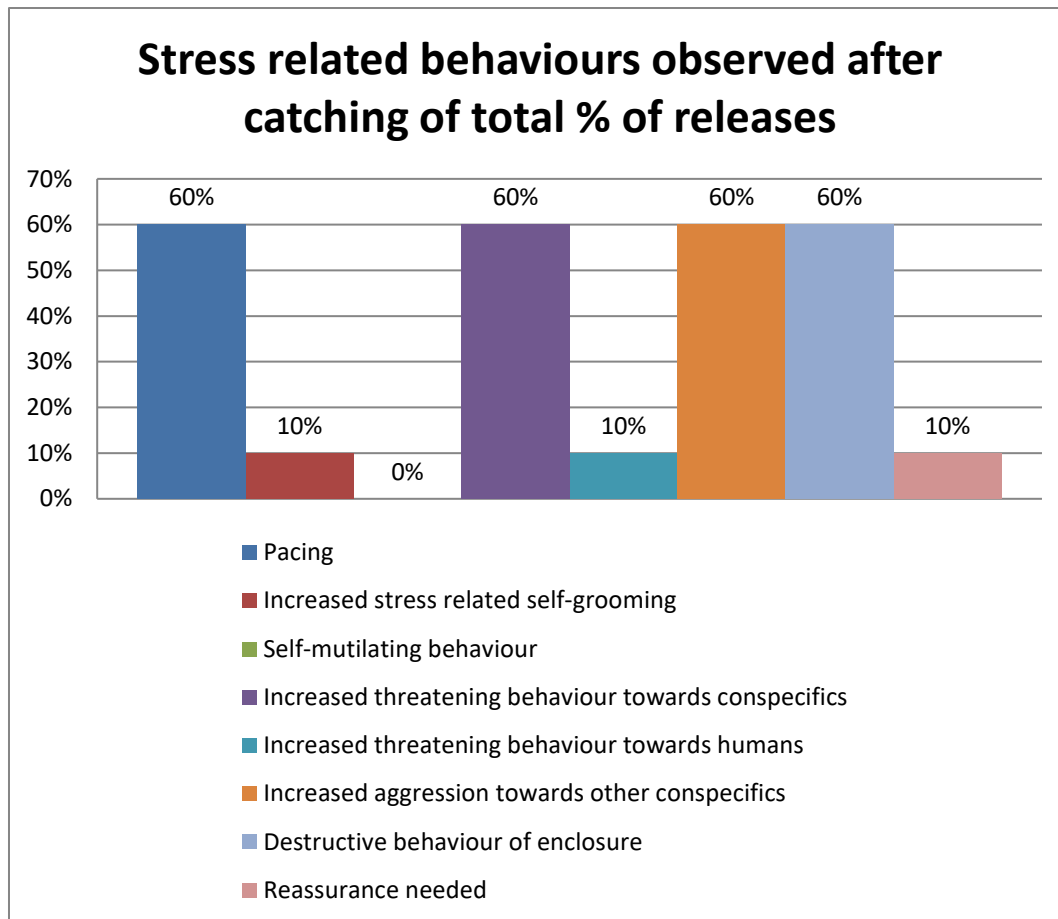
## Stress related behaviours observed after catching of total % of releases

Legend:
- Pacing
- Increased stress related self-grooming
- Self-mutilating behaviour
- Increased threatening behaviour towards conspecifics
- Increased threatening behaviour towards humans
- Increased aggression towards other conspecifics
- Destructive behaviour of enclosure
- Reassurance needed

Values shown: 60%, 10%, 0%, 60%, 10%, 60%, 60%, 10%

**Figure 9 Stress related behaviours observed after catching of total percentage of releases.**

**Post-reintroduction behaviour & interventions**

In 60% of the releases the animals utilized their pre-release enclosure for a couple of weeks after release. The majority of these releases involved the animals being transported to a new enclosure (5 out of 6 releases). With one release the animals were released from their rehabilitation facility (vervets) and kept using their enclosure for weeks post-release as well. Two other releases took place directly from the rehabilitation facility and these animals did not come back

to the enclosure from which they were released (vervets and Sykes). None of the chimpanzees did come back to the enclosure. No information was provided on this topic with the release of the mandrills.

In all of the releases the animals were supplemented with food after their release to provide an easier transition. This was done mostly around or within the enclosure from which they were released. Release number 7 to 9 supplemented the released animals besides in/near the enclosure in the home range of the released animals as well whereby the animals themselves or wild troops should not be present. One troop of 14 released animals (chimpanzees) split directly after release and did not come

back for provisioned food. Seven retrieval and reunion mission were executed in order to bring the troop back together. One animal died during one of those mission (did not recover from anaesthesia). One female integrated with a wild troop 5-6 months after being release. Another animal returned by himself to the sanctuary 1-month post-release, no further information was provided on what happened to this animal after coming back. After two separate reunion missions, one male and one female split again from the troop.
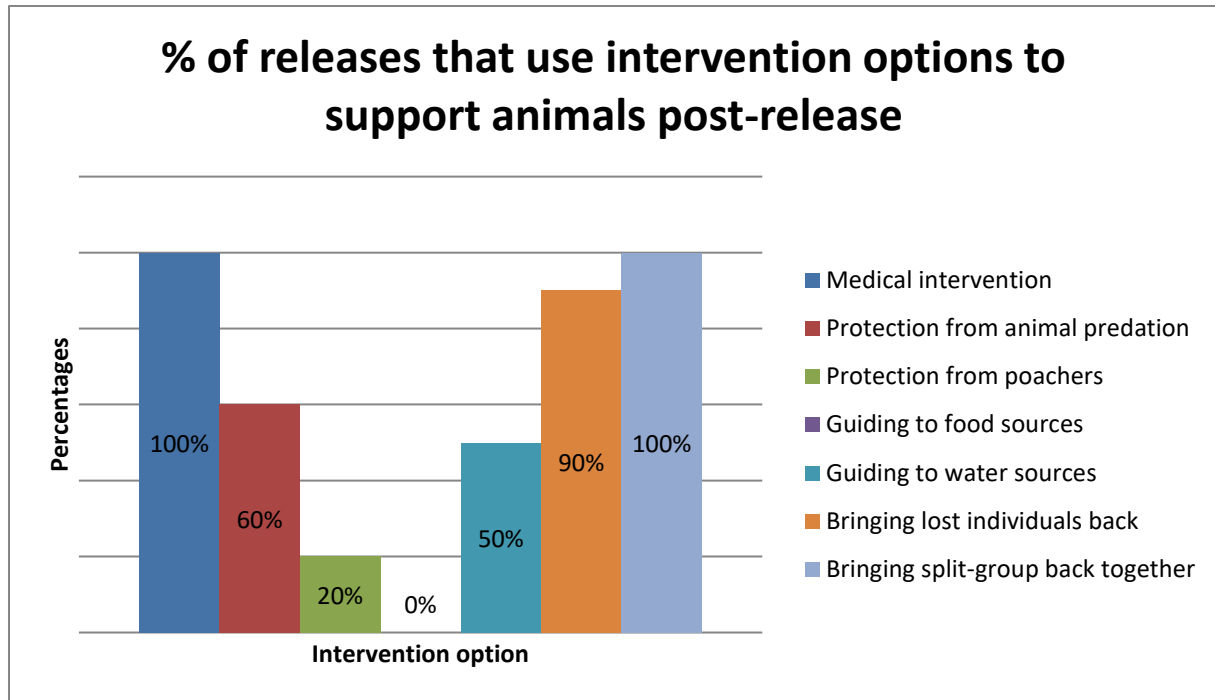
**% of releases that use intervention options to support animals post-release**

Legend:
- Medical intervention
- Protection from animal predation
- Protection from poachers
- Guiding to food sources
- Guiding to water sources
- Bringing lost individuals back
- Bringing split-group back together

Y-axis: Percentages
X-axis: Intervention option

Bar values: 100%, 60%, 20%, 0%, 50%, 90%, 100%

**Figure 10 Percentage of releases that use intervention options to support animals during release.**

In order to support a successful release, a range of interventions were used in 100% of releases (Figure 10). "Bringing a split-group back together" and "medical intervention" were used within all releases. Guiding animals to water sources contributes to a successful release. None of the respondents reported guiding released animals to food sources, although 50% reported guiding them to water sources.

Data which was most often collected during a release included general behavioural data, social interaction, immigration and emigration of animals, their reproductive behaviour and information

on animals lost (Figure 11). Only two releases provided additional information on individual animals and their fates after release (release number and species?). Still, 100% of the releases were deemed as successful by the respondents.

One release of vervets indicated a 66.6% survival rate 18 months post-release. After 4 years post-release, 8 individuals were born and 42% of the initial released troop was still alive. All the released females gave birth post-release. Further information on post-release survival and reproduction of the released animals was not provided.
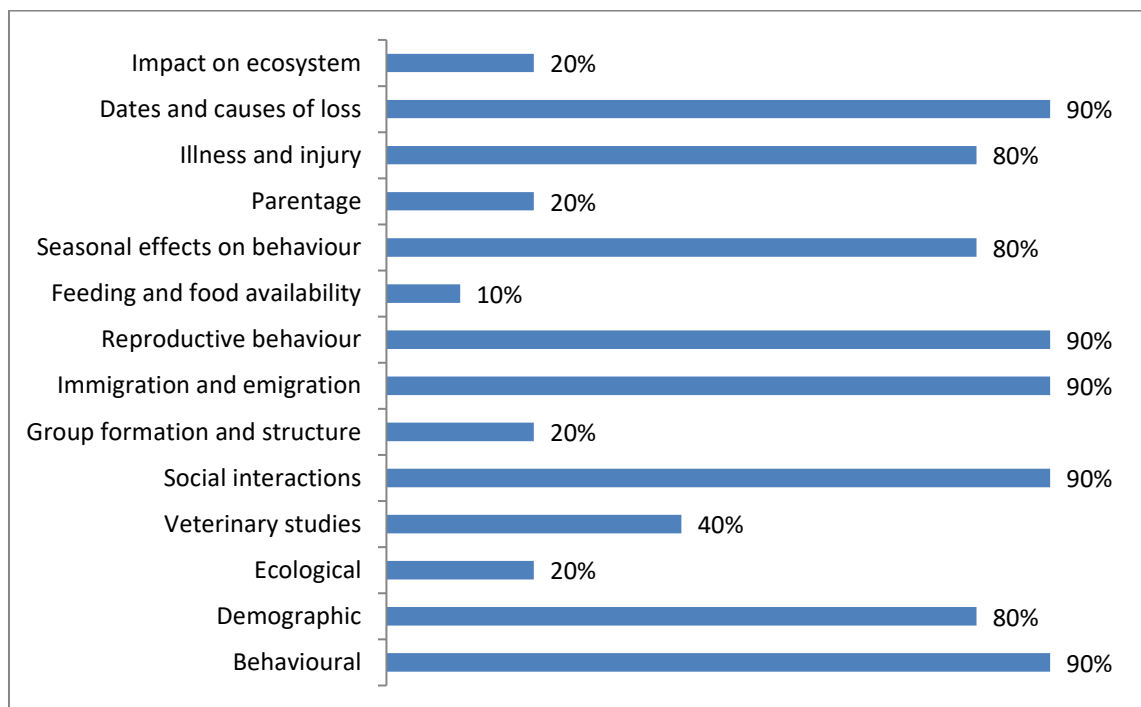


**Figure 11 Type of data analysed in total % of releases.**

Respondents were asked what factors they considered to have contributed to the success of the release or impaired the success of

the release. The factors listed by the respondents are outlined in Table 5. For the release of the chimpanzees (number 9), the respondents noted that the troop had no pre-release enclosure since it burned down, which was seen as an impairment to success in this release since it precluded a soft release. This troop dispersed immediately after release.

Good or high survival rate was listed for 3 out of 10 releases as a factor that contributed to the success of a release. Since this is a measure of success rather than a factor contributing to it, it is likely that the language of the questionnaires caused some confusion.

Respondents for release number 6 (vervets, least concern) reported losses of animals due to human-wildlife conflicts and the risk of having a low number of adult animals in their troop composition. In order to track animals, collars were placed on some of the animals prior to release within all released troops. Considerations that were made by sanctuaries on which type of collar to use included: weight, flexibility of the belt, external antenna, battery life, and rot-off parts. Animals that received collars involved adult males and females only. No problems were observed with the animals who received a collar. For 50% of the releases no factors were reported as either improving or impairing the success of the release.

Table 6 give an overview of the similarities which were found between the different releases across the different sanctuaries and Table 7 the reported challenges faced when planning and conducting a release.

**Table 5 Factors contributing to and impairing the success of release.**

| Release nr. | Factors contributing to success of release | Factors impairing the success of the release |
|---|---|---|
| **1-5** | - | - |
| **6** | Adhering to IUCN Guidelines<br>Lengthy rehabilitation<br>No transportation to release site<br>Post release monitoring with knowledgeable personnel | Low food availability<br>Low nr of adults within troop<br>Human-wildlife conflict |
| **7** | High survival rate | - |
| **8** | High survival rate | - |
| **9** | Good survival rate<br>One female emigrated<br>High birth rate<br>Ok survival rate | Not being able to do a soft release<br>No delimitation for release site territory |
| **10** | - | Protection of the park |

**Table 6 Overview of similarities found within reported releases.**

**Similarities found between all releases**

| | |
|---|---|
| **1.** | Research performed on food availability, types of food and human populations in release area |
| **2.** | During release animals receive security in the form of presence of researchers or guards |
| **3.** | All animal received supplemented food post-release |
| **4.** | Intervention options post release: medical intervention, bringing split group together |
| **5.** | Indicators used during group formation: 'individual character & relationship' and 'medical situation' |
| **6.** | Individual releasability testing on individual body condition, showing abnormal behaviour, physical disability and medical situation |
| **7.** | Troop suitable for release based on group cohesiveness |
| **8.** | Testing on foraging behaviour |

**Table 7 Reported challenges faced when planning/conducting a release**

**Potential indicators that contribute to less successful releases**

| | |
|---|---|
| **1.** | Lack of funding |
| **2.** | Inexperienced people |
| **3.** | Age of animal |

**4.** Lack of security, increased poaching

**Discussion**

To date relatively little information about African primate reintroductions has been published. The four sanctuaries who participated in this pilot study work with different species of primates and great apes and work in different habitats and surroundings, each dealing with their own intrinsic challenges.

The aims of this pilot research were therefore to gain a better understanding of how primate releases are conducted across Africa and to identify factors that may either contribute to, or impair, the success of these releases for individual animal welfare as well as conservation goals.

Firstly, we assessed which guidelines each sanctuary used when planning and conducting their releases, and the extent to which these guidelines were followed. The IUCN guidelines state that when releasing vulnerable and endangered species, all reintroduction guidelines should be followed. Expectations would be that release of animals with these classifications are done strictly according to IUCN guidelines due to the more urgent need to conserve these species. However, respondents reported that fewer factors were taken into consideration for releasing a vulnerable species compared to 'least

concern' released species. A possible explanation for these results can be related to the interpretation of the question by the person that filled in the questionnaire. Similar unexpected differences were observed within the topic 'individual releasability testing' and 'making changes to a group of animals'. Both releases were still considered as successful by respondents. It remains unclear whether complying to IUCN guidelines more strictly and taking more factors into account when testing individuals or making group changes contribute significantly to the success of a release.

Sanctuaries reported that for 8 out of 10 of the releases, the sanctuaries' own guidelines were used. A large number of the releases therefore were planned and conducted at least partly based upon non-standardised guidelines. This highlights the need for a set of guidelines that all sanctuaries are able to follow, which will allow for a more standardised approach to reintroduction and also allow for a better assessment of success levels in new re-introductions. All sanctuaries reported that they complied with the 'Post-release monitoring guidelines' from the IUCN in the highest capacity.

The main goal of all releases was to 'enhance the psychological or physical well-being for individual'. It is important to what is meant by 'welfare releases. The term 'welfare' as used in 'welfare releases' refers to the welfare of the individual animal, as it is referred to when

discussing the welfare of an individual animal housed in captivity. However, life in a captive setting can be on a continuum of good to bad, and this holds true for life in the wild. The assumption that being released into the wild is better for the welfare of the animal can cause us to overlook factors that might impact successful survival and a good life in the wild, to the same extent that living in captivity by definition means to some that life is always good. There are problems on both sides of these assumptions.

The IUCN Guidelines for Nonhuman Primate Re-introductions (Baker, 2002) do not recognize rescue/welfare-based reintroductions as true conservation approaches, as there is always a level of risk for the animals introduced, the habitat, as well as existing wild populations. This may explain why the Precautionary Principle was adhered to the least of the IUCN guidelines. However, it appears these releases can still be successful in terms of survival. The importance of releases based on these motivations should therefore not be overlooked since they can contribute widely to understanding which factors drive or impair the success of a release. By understanding these factors better, they can be applied within reintroduction with different goals and objectives and will benefit primate conservation in general. It is therefore recommended to incorporate information from primate releases that have been elsewhere executed, regardless of their main goals and objectives. With the releases assessed here, multiple goals

and/or objectives were set and since they are not focusing only on increasing the individual welfare, these releases can be seen as 'true conservation approaches' as Baker (2002) states.

All of the releases were troop releases that used a soft release strategy. The IUCN describes soft releases as thus: 'animals held in enclosures at or near the re-introduction site prior to release, to assist them in adjusting to their new environment. Post-release support, such as supplemental feeding and protection from predators, is usually provided.'

It is generally assumed that a soft, vs hard release, where animals are immediately released at the site with no post-release support, is the better option. However, there may be negative impacts of this type of release that remain to be evaluated. For example, seeing familiar human faces appearing to provide supplemental feeding or to check on the health of the released animals is likely to maintain a (very) strong connection of the animal with humans, which may lead to maladaptive behaviour. For example, research with released orangutans has shown that individuals with particularly strong attraction to humans (due to their time in captivity) sometimes engage in atypical behaviours (coming down from the canopy) in order to be close to human researchers monitoring their post-release behaviour (Basalamah et al., 2018). Interaction and contact between

the animals and the release team can vary between release and species. Bonds between vervets and baboons, or chimpanzees and the care staff can differ, with chimpanzees and human care staff often having intense bonds. It all depends on how the animals respond, and the bond the animals have with the people in the release team, and the effect this may have on their choices.

Although with the release of the chimpanzees the males were released with a soft release strategy, the females were not. The entire troop, both males and females, split up after release. It is unclear if this split is the result of the females not having the ability to adjust to the new environment, or if there were other reasons. The respondent of the questionnaire mentioned that: 'As the sanctuary is only 30 km away, the environment is the same and they didn't need acclimatization', the outcome indicates a different reasoning whereby an acclimatization period is favourable.

It also a natural process for male primates to disperse and integrate in wild troops by themselves or in sub-groups. Although troop releases might have an advantage in relative costs and resources used, single animal releases using a hard release option is a strategy that hasn't received attention in previous research.

For group-living primates, being released in a troop may be an advantage in part, to be and maintain within the familiar group they have known for a longer period of them. These group may join a wild group of primates together, something that sometimes happens.

Respondents reported that challenges faced with regards to the team were time spend on training, lack of human resources and funding, and a lack of experience in tracking animals. This resulted in fewer data acquired and the loss of the ability to follow radio tracking signals of animals. For 60% of the releases no challenges were reported with regards to the team. All teams had experienced staff with regards to the interpretation of the collar acquired data.

The number of individuals per troop chosen was based on naturally occurring troop size in the release area and readiness for release for 30% of the releases. We found that, for a further 20% of releases, the number of animals per troop released was based on the number of individuals at the sanctuary (chimpanzees and mandrills). Factors that are taken into account with all release when making changes to a troop are 'individual character & relationship' and 'medical situation'. This remains unclear for 50% of the releases.

The time that release groups had spent together pre-release ranged from 0-1 year to over 10 years in the case of the chimpanzee release.

In order to analyse group cohesion, respondents reported the use of social network analysis for 90% of the reported releases. While this is likely useful to assess the group cohesion, we do not have details about how the results of these analyses were used in making decisions. It would be beneficial to see more data on how sanctuaries use this information when making decisions about troop cohesion and release. Here, standardised guidelines on measuring group cohesion and in how to use these data to make decisions regarding troop releasability would be very useful.

Interestingly, the chimpanzee group that had been together for over 10 years dispersed directly after release and did not come back to their enclosure for food. 100% of the releases involved bringing back split-groups and 90% of the releases involved returning lost individuals. The fact that some animals dispersed so quickly after release suggests the need for more thought and practical considerations, as to how groups and troops are established and kept together. Groups formed in captivity are artificial and usually not representative of wild groups, especially in terms of kinship. A mix of management practices such as abundant food provisions, enrichment, physical structures and animal training (formal or informal) are used to keep groups together to a certain degree in captivity, and care staff are carefully reviewing interactions and behaviour.

If individuals often disperse and groups breaks up after release, as might be expected given the artificial nature of the grouping, perhaps different strategies could be considered, such as animals choosing their own group members across time and taking into account individual personalities. It should also be considered that it is natural for some individuals, such as female chimpanzees or male vervet monkeys, to disperse to new groups and bringing them back to their release group may not always be the optimal strategy. As all of the released troops required some level of post-release intervention, the financial implications of all of this effort together should be weighed against longer housing periods in a sanctuary where possible. A longer rehabilitation and time at the sanctuary time, including living in an established group for longer, may lead to less interventions post-release, however, more data is needed to understand these aspects.

All animals received veterinary screening prior to release. This was most intensive within one release of chimpanzees, where 28 different tests were performed. Testing for hookworm (100%), balantidium coli (70%), whipworm (90%), pinworm (80%) and tuberculosis (100%) was completed for most releases. If animals tested positive, they were treated accordingly and continued to be released. Sedatives or calming products were not used during any of

the release. Pre-release medical screening is extremely important, particularly where there is the possibility of released individuals coming into contact with wild individuals. However, veterinary testing and screening are not necessarily easy or possible in many of the home-ranging countries. When creating future guidelines, it will be important to specify for each species tests that are which necessary prior to release, versus those that are optional. Sub-divisions made when grouping species in different categories based on their susceptibility to certain diseases and/or prevalence in the country itself can be advantageous.

Releases were financed through a combination of internal (from the sanctuary) and external funding (e.g. grants and donors). One release was entirely funded by external donors. Major points for improvements were reported if the projects had more funding available, including better equipment. This highlights an extremely important point, which is that sanctuaries may lack the ability to follow all guidelines due to a lack of funding. This suggests that sufficient funding is crucial to a sanctuary's ability to conduct a release within the proposed guidelines and indicates that more funding for releases will increase the likelihood of their success.

The following indicators were used to test individual releasability by all the sanctuaries: individual body condition, showing abnormal

behaviour, physical disability and medical situation. Respondents reported that animals that were deemed unfit for release were integrated in other captive troops or kept as a surrogate mother at the sanctuary. For all releases foraging behaviour of the animals was analysed in different ways prior to release and wild plant and fruits that are naturally occurring in the forest were added to their diet. While it is good that the foraging behaviour of the animals is being analysed prior to release, standardised ways of measuring this behaviour across sanctuaries would be useful. For example, criteria could include a majority of animals in the release group having eaten a certain number of naturally occurring foods prior to release or shown their ability to locate and forage upon naturally occurring foods. If data were taken on the groups' foraging ability prior to release, this could be compared to data on their foraging post-release to identify the amount of natural food provisioning necessary to allow for sufficient post-release foraging behaviours.

Respondents also reported other tests that were executed prior to release, which involved snake (40%), big cat (40%), dog (30%), human (40%), baboon and electrical wire testing. In general, when looking at troop releasability testing and predator awareness testing, both are relatively low compared to what one would expect them to be in order to base release decisions on. The big cat awareness test was used to have an influence on the success of a release.

While predator/danger avoidance training is not currently included in the IUCN guidelines (Baker, 2002; Beck, 2007), allowing the animals to learn about natural predators or human-related threats is likely to contribute to the success of a release. It is important to adapt these tests to the natural predators of the location of the release, which may not always be the same. Additionally, instilling human avoidance behaviours is likely to become increasingly beneficial for many species, although the history of human contact with sanctuary-housed animals is likely to make this difficult to achieve.

Challenges with collars have been reported in other reports and experiences such as collars being too big in size and weight for the species, as well as the costs associated with them. Benefits of collaring animals include the ability to monitor animal health and the ability to collect data which was otherwise not possible. Collars can be also valuable in case animals are poached or predated and can give more insight into what exactly happened. However, within this research no information was provided on this specifically.

In order to find a suitable release site different analyses were performed. Analyses of food availability, types of food and the human population at the release site were conducted for all releases. Population assessments and identification of water sources and

sleeping sites were also performed for 80 of releases. Sanctuaries executed analyses on carrying capacity, human livelihoods and human attitudes for two of the releases. The chosen release sites for the releases varied in terms of size, surrounding area and ecological borders and distance from the sanctuary. With rapidly decreasing natural primate habitat, it is likely that release sites are increasingly governed by what is available, rather than what is optimal. However, issues with post-release human-wildlife conflict were reported for some releases, which highlight the importance of considering the likelihood of this when selecting a release site. Two of the releases involved a pre-release survey of local human livelihoods and attitudes to the release. It is crucial for the success of release and future work of the sanctuary that the released animals do not pose a threat to local human communities or their livelihoods and therefore it is strongly recommended that sanctuaries engage with local communities prior to release and ideally create a plan in case of future human wildlife conflict stemming for the release.

In 50% of the releases, animals were kept for 15 days within a pre-release enclosure within the release site. This is usually done to allow animals to acclimatize to their new environment, to recover from stress caused during translocation and to discourage them from dispersing from the release site directly after release. During the chimpanzee release, the pre-release fence burned down and

therefore an acclimatization period was not possible. The chimpanzees dispersed immediately from the release site. During one release, animals were kept in the pre-release enclosure for 180 days. This was done in order to determine the animals' habituation time by checking the cortisol levels in their stool. Unfortunately, we did not receive information on these results or how they were used and if they were taken in combination with other parameters. Cortisol may be of help to gauge animal welfare, but as a standalone measure, it may not be easy to interpret. It would be useful if more data was collected and shared concerning behaviours and physiological measures during pre-release holding periods. This may enable to sanctuaries to determine an optimal time for pre-release holding, although a balance would have to be found between letting the animals acclimatize and keeping them in the holding cage for so long that the release from that cage becomes more stressful. Increased tension between males might be an indicator for releasing animals, and the size of a pre-release enclosure is in most cases smaller than the animals' enclosure at the sanctuary which might lead to less conflict avoiding behaviour and therefore a higher level of stress. Doing checks however does also involve more human presence which can also lead to a higher stress level or further habituation which might not be ideal.

In 30% of the releases, animals were released from their rehabilitation site and therefore no acclimatization period in a pre-release enclosure was needed. With these releases additional costs and problems perceived with regards to transportation were kept to a minimum. Stress-related behaviour which were observed in order to prepare animals for transportation was therefore also kept to a minimum. Stress related behaviours which were observed after being transported were therefore not applicable. In this case the animals came from the release area and it also being the release site. The intention of having a pre-release enclosure in a new habitat is the desire that animals stay near this enclosure and establish a new home range in the vicinity and get habituated to their new environment. Over time animals disperse and integrate with other troops they come across.  One may wonder then that when animals stay close to the release site, this could indicate a less positive experience for them, fear of the unknown and unwillingness to wander further, as well as a need to establish a new home range. These results show that in-situ rehab can have a lot of advantages. However, many rehabilitation facilities cannot facilitate that due to their location, and the type of species they are working with (danger hazards). Building camps in-situ also for long term rehabilitation which is needed with primates is also very costly. However, moving animals as soon as possible to a pre-release enclosure can be an

important factor stress can be eliminated earlier in the process and it gives animals more time to adjust to their new environment.

An important finding from this study was that, in order to support a successful release, some form of post-release intervention was used in all releases. Bringing a split-group back together and helping animals that have been injured were used within all releases. One sanctuary guided the animals to water sources, but no other information is available to date about how this affected release success. This strongly suggests that post-release interventions are a major factor in releases that are perceived as successful. However, these post-release interventions can be intensive and increase the cost and effort of a release. Therefore, in order to allow organisations to fully anticipate the efforts and costs related to all these activities it would be highly beneficial to create a system that allowed information, such as scale and cost of post-release interventions, to be shared by sanctuaries. This would allow organisations planning releases to make informed decisions on expense and outcome. Indeed, a system which allows for the sharing of all data generated from releases would be highly beneficial to refine and improve release procedures, as well as allowing sanctuaries to anticipate costs and logistics. Crucial to this will be post-release data on the release animals. From the releases we analysed, information most often acquired during a release were general behavioural data, social

interaction, immigration and emigration of animals, their reproductive behaviour and information on animals lost. Two releases provided additional information on individual animals and their fates after release.

One release indicated a 66.6% survival rate 18 months post-release. After 4 years post-release 8 individuals were born and 42% of the initial released troop was still alive. Another release reported a 75% survival rate almost 2 years post-release. All the released females gave birth post-release. Further information on post-release survival and reproduction of the released animals was not provided. Although some post-release information was collected for all releases, the information that respondents reported varied substantially in terms of type and detail, and only two releases reported long-term survival rates.  Still 100% of the releases were deemed as successful by respondents. This is positive, given that sanctuary personnel considered the release went well, yet it highlights the fact that there currently exist no standardised criteria which can be used to assess whether a release can be considered as "successful". In theory, a wide range of measures can potentially be used to assess the success of a release, including individual survival (Guy et al., 2012), reproductive success (Goosens et al., 2003), dispersal into wild groups (Humle et al., 2011), achieving 'natural' behaviours after reintroduction (Stoinski et al., 2003), or achieving a self-sustaining

population (Moscovice et al., 2010). Additionally, the length of post-release monitoring can dramatically alter whether a release is considered successful or now (e.g. the animals may be doing well in the months following release, but may struggle to reproduce and rear young, or to forage sufficiently during seasonal changes). The IUCN guidelines make recommendations for post-release monitoring, but the findings from this study suggest that a standardised set of guidelines that gives recommendations on specific data to be collected post-release, which taking into consideration the limited funds available for most releases and adapted for each species, would be highly beneficial. This will allow sanctuaries to more objectively analyse the success of a release and to provide data which can be used to continuously refine release practices.

Factors that respondents attributed to the success of releases were a lengthy rehabilitation period (20%), survival rate (30%), adhering to IUCN guidelines (10%), post release monitoring (10%), high birth rate (10%) and immigration of an animal (10%). Reported factors which were perceived to have had a negative impact on the success of the releases were releasing young animals (10%), not being able to use a soft release approach (10%), no delimitation for release site territory (10%) reduced security in the release site area (10%). These are valuable observations in this project and suggest that following IUCN

guidelines, the use of a soft release approach and a secure release area are also important factors in the release process.

The results from the chimpanzees also suggest that adult wild-born individuals (>14 yr. old) that have benefited from a lengthy rehabilitation in a group setting in a similar environment to that provided by their future release site may have a greater chance of success on release. Further data is needed to confirm this, as well as if this is similar for different species. For example, studies with orangutans have suggested that individuals that have been in rehabilitation longer have shown fewer natural behaviours after release (Descovich et al., 2011). It is possible that there may be an optimum time for release wherein individuals are old enough to survive will in the wild but have not been in captivity too long so as to find adjustment to wildlife too difficult.

In particular, it would be useful to have more information on individual outcomes of animals. While a longer rehabilitation times may increase chances of success, it remains to be seen whether this ideal situation can be united with what is possible in reality, when resources are low, space limited, and to the sometimes-problematic background of many of the animals.

Adult animals from the wild can be instrumental in teaching other animals within their troop through social learning. It is therefore highly preferable to compose troops with animals that come from the wild when possible (Whiten and Erica van de Waal, 2018) in order to adapt proper strategies. Troop composition consists normally in adults and sub adults, juveniles and infants. Infants increase bonds between females and therefore troop cohesion within vervets which is preferred.

This data together with survival data and the information collected during and after a release will be key in understanding which factors contribute to the success and failure in primate reintroduction programs. Further work should focus on determining criteria of success, failures and factors contributing to or negatively impacting release success.

As tracking and monitoring animals is expensive each participating PASA sanctuary was offered funding to buy equipment related to monitoring reintroduced animals, such as camera traps, GPS receivers, digital cameras, and binoculars.

### *Limitations of the research*

We encountered some limitations during the course of this project. Only four sanctuaries participated in this pilot study and therefore

the low amount of data it is problematic in assessing which factors contribute to successful releases in general. As we do not have any numbers on failures, it is hard to assess success. A problem in the area, and indeed research in general, is that failures may be less likely to be reported than successes. However, there is much to be learned from failures and we would encourage organisations to share data on releases perceived as less than successful, as this will enable analyses of factors that contribute to successful releases.

There also appeared to be challenges in communication regarding the questionnaire. The questionnaire that was sent in French and in English contained a large set of questions. Although these questions are all relevant, it is understandable that respondents faced challenges with providing all information and time needed to respond. Additionally, the questionnaires were sent in a Word document which might have resulted in respondents missing or overlooking questions. Sending a Word document is favourable due to limiting downloading time to remote sanctuaries that have minimal internet access, nonetheless online questionnaires with required fields, with drop-down menus that decrease the amount of time required texting or interactive PDFs might result in a higher quality of data.

While experienced translators translated the questionnaires in French, still the high use of technical terms and language barriers

naturally occurred, and we tried to solve this through the use of multiple translators. Ensuring that translations are checked by French speaking professionals in the field of primate care, welfare, and reintroductions will greatly reduce confusion and difficulties interpreting and completing surveys, and data interpretation better in the future.

Some questions in the survey were not answered, partly answered, or answered in a way which was not in the line with the question asked. All these were excluded from the dataset. As not all information was provided by the respondents for various reasons, it made analyses and interpretation of results difficult. We are hoping that with this first analysis of the received information in this pilot study, PASA and the PASA sanctuaries can develop better documentation and open system for easier access and more robust results. We also hope that this will result in the ability to share potential sensitive information, and that sharing information does not need to be in conflict with other research projects.

This project amongst PASA members also indicates the necessity and potential for the development of a 'release manual' that can be used when sanctuaries want to pursue a release. This project has highlighted the need for a structured approach with regards to reporting data on releases. This manual should provide the following:

best practices based on research, a standardised way of reporting data and important check lists and other information that it is considered valuable for sanctuaries to know. This manual should complement the IUCN guidelines for primate reintroductions and will expand on the best practices below.

**Conclusion**

From this pilot study, we have gained valuable information on the reintroduction and release practices of a number of PASA member sanctuaries. We have identified specific challenges which the participating sanctuaries face when planning and/or conducting a primate release. These include a lack of funding and lack of training for post-monitoring personnel, which resulted in a inability to monitor the group long term. This research also highlighted factors that the respondents felt negatively impacted upon the success of each release which included low food availability, a low number of adults within the release troop and problems with human-wildlife conflict.

We also identified factors that likely had a positive effect on release success, including the importance of conservation awareness. This research found that when the goal and/or objective for pursuing a reintroduction involved 'promoting conservation awareness' this

influences the perceived reintroduction success. Promoting conservation awareness often involves educational campaigns and other sensitization projects and funding. This results in an increased involvement of the public when they encounter (released) animals, which can lead to a higher survival rate post-release. Campaigns appear to be an effective tool to increase the success of a reintroduction, but this is a costly and time-consuming part of a pre-release plan. Not all sanctuaries will have the resources to be able to execute these kinds of campaigns.

A 'big cat awareness test' was used in one of the sanctuaries. The type of predator awareness tests that are used to test animals prior to release is dependent on the natural predators that are present in the release area. This dataset contained many releases of one particular sanctuary that used this as one of their predator awareness tests. Guiding animals to a water source during the release event to support them was found to be another influencing factor on the success of a reintroduction, especially when animals are not familiar with their release area. It is unlikely that this is the only intervention option that positively influences the outcome of a release. Further information on how these were used and effects on releases is unknown to date.

Importantly, we have identified the lack of standardised protocols for release and post-release reporting, that likely hinders the identification of factors that contribute to a successful release. This knowledge will help us in creating a release manual for PASA sanctuaries to complement the IUCN guidelines. Improved communication, including sharing of data, experiences, and failures, together with a more transparent policy for working within PASA, as well as external entities such as universities and others, should yield more and better-quality data in future research projects. Future research that includes failures as well as successes will enable more thorough analysis of the factors that contribute to successful releases.

**Recommendations**

- The development of a PASA reintroduction manual that expands on the best practices, complimentary to the IUCN Guidelines, including what criteria should be used to measure success, what data are to be collected and how, challenges to be expected, and identifying the most important and fundamental tests prior to release and why.

- Creation of a protected open database of all releases of PASA member sanctuaries

- Creation of financial models to evaluate investments during the release process, and a decision tree weighing different parameters to aid in the decision-making process

- Creation of an overview of species differences and similarities for success and failure for primates housed in PASA member sanctuaries

- The development of a general database where PASA member sanctuaries can safely share information and date, to learn from each other about reintroduction efforts

**Best Practices**

- A thorough use of the IUCN primate reintroduction guidelines, with the addition of welfare-based releases that are not deemed detrimental to wild ecology/animals

- Ensuring that monitoring staff are thoroughly trained in tracking individuals prior to release

- Ensuring there are financial provisions for the post-release interventions that may be required

- Ensuring a sufficient number of adults in release groups

- Thorough assessment of the potential for human-wildlife conflict in release site

- Engagement with local communicates prior to release to promote conservation awareness and to identify any potential areas of conflict
- Ensure protocols in place for post-release interventions based on a range of scenarios.

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